eering
ry

DEC 7 - 193

Engineering News-Record

McGraw-Hill Publishing Company, Inc.   Twenty-five Cents — Five Dollars per Year

December 3, 1931

◆

Featuring a timely group of articles on

Low-Cost Construction For Local Roads

Bankruptcy of Local Road Administration
By Charles W. Ross

Condition and Needs of the Local Roads
By Thomas R. Agg

Fitting Road Improvements to the Budget
By Harry J. Kirk

Some Local Road Improvement Operations
By C. E. Grubb

Engineering in Local Road Improvements
By P. M. Tebbs

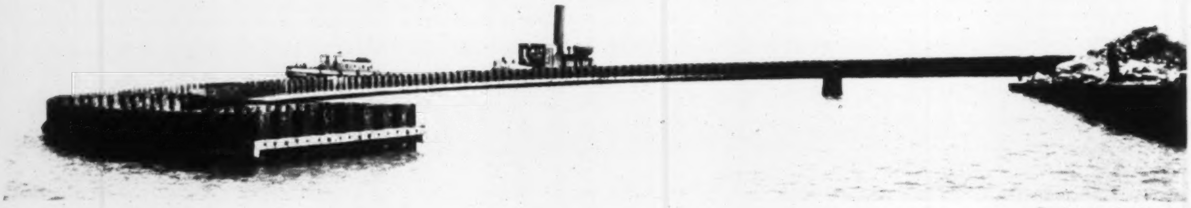
Materials and Surfaces for Low-Cost Roads
By J. T. Pauls

Local Road Construction and Maintenance
By B. E. Gray

Road-Mixed Gravel for County Highways
By Glen B. Cook

Also

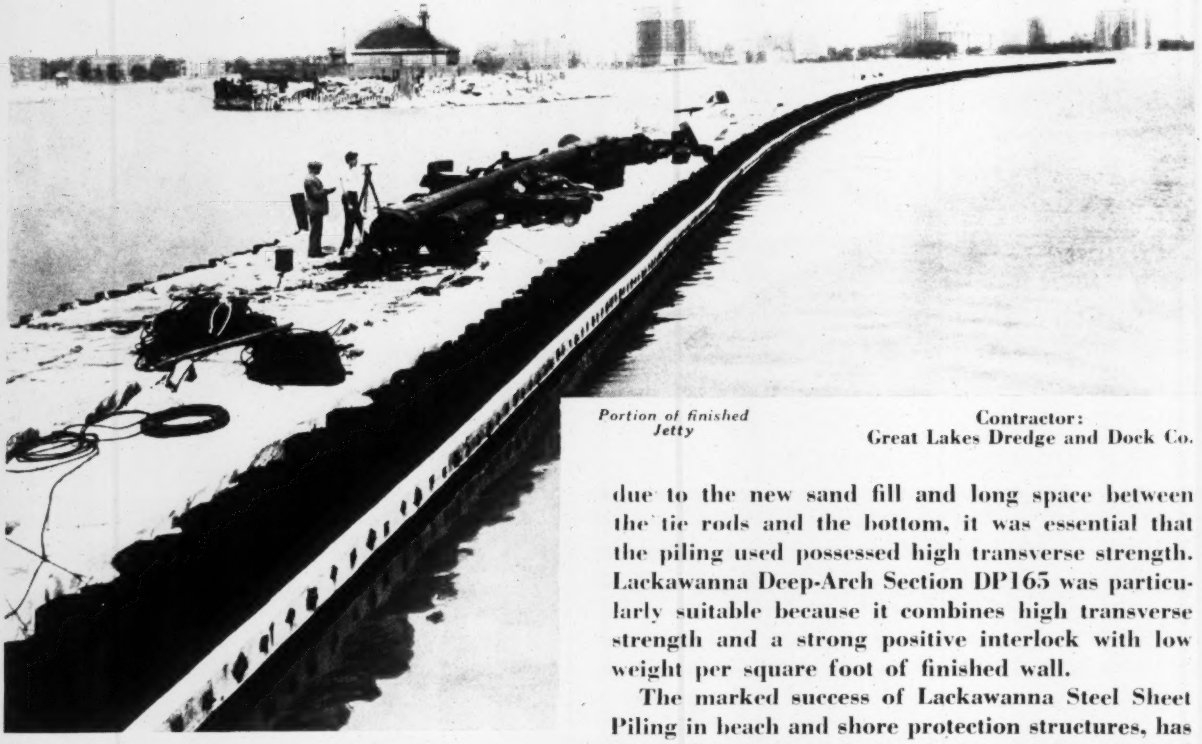
Horizontal Shear in New Rolled Steel Sections
New Railway Line Pierces Pyrenees Mountains
Hand Labor on Public Works in Newark, N. J.



Portion of finished Breakwater

LACKAWANNA Deep-Arch PILING

used in constructing 4500 lineal feet of stone-filled Breakwater and Jetty



Portion of finished Jetty

Contractor:
Great Lakes Dredge and Dock Co.

FORTY-FIVE HUNDRED TONS of Lackawanna Steel Sheet Piling Section DP165, in 40 and 42-foot lengths, were used in the installation of a 2000-foot breakwater and a 2500-foot jetty in about 20 feet of water, for the Lincoln Park Commission, between Montrose Avenue and Margate Terrace, Lincoln Park Extension, Shore Land Reclamation, Chicago, Ill.

Both the breakwater and the jetty consist of two walls of Lackawanna Section DP165, from 14 to 20 feet apart, tied together with steel tie rods and filled with quarry-run stone and 3 to 6 ton cap stones. A sloping toe of riprap 8 feet high was placed on the lake side of both installations to prevent scouring.

Because of the pressure against the sheet piling, due to the new sand fill and long space between the tie rods and the bottom, it was essential that the piling used possessed high transverse strength. Lackawanna Deep-Arch Section DP165 was particularly suitable because it combines high transverse strength and a strong positive interlock with low weight per square foot of finished wall.

The marked success of Lackawanna Steel Sheet Piling in beach and shore protection structures, has been an important factor in its greatly increased use for such purposes.

There is a Lackawanna Piling Section—Deep-Arch, Arch-Web or Straight-Web—for every purpose. Bethlehem engineers will gladly cooperate with you and suggest the section most suitable for your job.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, Dallas, Houston

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL OF CIVIL ENGINEERING AND CONSTRUCTION PRACTICE

Volume 107 ✦ Established 1874 ✦ McGraw-Hill Publishing Company, Inc. ✦ Number 2

F. E. Schmitt, Editor

DECEMBER 3, 1931

✦

Low-Cost Road Improvement: A Critical Highway Task

New Problems

EVERYONE knows that the condition of secondary county highways and township roads is far from satisfying modern traffic needs. Now the public is demanding more and more insistently that the general road funds be used for their improvement, and legislatures are meeting this demand. As a result, within five years, and particularly within the last two years, local roads have become increasingly an obligation of centralized administration and engineering planning.

So far the actual changes from local management have been few. But powerful forces are coming out of the present business depression to hasten action. First of these is the pressing demand for reduction of property taxes. Second is the accumulating proof that in hard times local road management is wholly unable to carry on normal improvement programs, much less to help in unemployment relief by accelerating roadbuilding.

Thus, the question directly facing highway officials and road users is: Where does the country stand in its local-road administration and physical development and what action is necessary? As a beginning toward an answer and a foundation for constructive discussion, a large part of this issue is devoted to articles on local-road administration expenditure and engineering development. Some specific conclusions are clearly indicated.

Provide Purposeful Direction

FIRST, county and township administration in general has proved itself bankrupt in initiative and ability to provide secondary travel routes which satisfy the necessities of modern road transportation. The few striking exceptions that can be named only emphasize the ineptitude with which the majority of secondary political units conduct their highway affairs. In the hard times of business depression both counties and townships have shown lack of enterprise. So generally have they failed to function constructively in the present emergency demand for public work that increases in federal and state activities have been largely nullified.

Poor distribution and poor management of local road funds are more generally the reason for unimproved secondary roads than is the lack of funds. The tax money available for local roads, if distributed according to a rational plan of feeder-road-system development and not according to political boundaries, would by progressive construction provide steadily better roads. Close engineering supervision alone is needed. But this is as unevenly distributed as is tax money: the rich counties command the highest quality and the poor counties and the townships generally are without any. Poor local roads are not due to lack of funds but to failure to spend intelligently.

Skill Is Available

Types and materials of construction are so widely diversified that no section of the country is lacking means to improve local roads. Equipment has been developed for the economical handling of all types and materials. Compared with paved-road building the construction of low-cost local roads gives to the highway engineer an enormous range of choice in materials and methods, and experience is rapidly furnishing quantitative appraisals of the services that they may be expected to render.

NEITHER poverty of local-road funds nor poverty of engineering and construction technique is responsible for the inadequate transportation service provided generally by nearly 2,500,000 miles of public roads in the United States. They are oppressed by poverty of management. It is this alone that has kept local roads in the mud and that prevents them from playing any material part in the efforts to give employment by public-works construction. These failures of management have been fewer in the counties than in the townships, and fewer in rich and progressive counties than in those without wealth and enterprise, but in comparison with federal and state highway activities the failures are alike, except in degree.

A Task Ahead

Highway officials have the immediate task of correcting local-road conditions. Whether or not they desire it, the user of local roads is forcing this task rapidly upon them. It is pertinent to inquire in what way they may best go about it. Opinion and practice are both floundering. Shall states assume responsibility for all roads? Shall the counties take over township roads? Shall groups of counties combine for road improvement to secure a more even distribution of funds and capable engineering planning and execution? All of these plans are being tried or considered; none of them has been carried far enough to have proved its success or failure; each presents formidable difficulties.

THE difficulties of the problem are great, but they in no way obviate the necessity for its solution. This is the situation that public roads officials must face squarely. It is their obvious duty to be prepared to direct legislation into the proper channels. If they fail in sound planning, legislation is still bound to come, but it may be less advantageous to them as well as to rational highway development.

NOTES OF THE WEEK

Act Now!

WITHIN less than a week after the first general appeal for funds went out the engineers' committee on unemployment of the New York metropolitan district reports the receipt of $18,600. With the subsequent four months' subscription payments this means a substantial sum for the relief of unemployed engineers. The result is encouraging in view of the fact that the latter part of the past week was broken into by the holiday. Results in the placement of men also are encouraging. Work has been found for 149. Developments at New York serve to emphasize one fact: time is a most essential element in such planning. Between the time a move to relieve unemployment gets started and the time money begins to come in and jobs are found there is a long and seemingly unavoidable lapse of time which works against the effectiveness of the whole movement. In this there is a lesson for those who see the problem arising on their local horizon but who have made little or no provision for meeting it. Act now while there is time for the necessary preliminary planning!

A Ghost to Be Laid

AMONG the many ghosts that frighten people away from sensible action in these days is the fiction that the country is overbuilt. That ghost needs to be laid. It is said variously that factories are overbuilt, office buildings are overbuilt, and houses and apartments are overbuilt. The statement lacks proof. Vacancies, low valuations, eagerness to find tenants, are at best arguments, but they are not proof. There were no such conditions two and three years ago; that they exist in a time of subnormal production and extreme contraction of business is natural, but proves no over-capacity. Let the matter be put to the test of free building credits and ample supply of realty funds, and an answer may be had in prompt revival of building operations. Perhaps the mortgage-discount bank proposal that is to be laid before Congress will provide the test. If it comes to realization with any promptness it will thaw out frozen building funds; and if at the same time it thaws out frozen psychology and puts an end to bank liquidation and hoarding it is likely to infuse such energy into building as to challenge the greatest pessimists of the overbuilt school.

Army Shifts

ANOTHER shifting of army engineer officers in the higher positions is to be made at the first of the year, as noted in our news pages last week. The men who are to be moved to new stations are key men, the engineer corps' official representatives in the major centers of army engineering activity. Reasonable length of tenure of office for these men, therefore, has many advantages: the officers get to know the district and its local problems, and the district gets to know the engineer officer through whom it must make its contacts with Washington. Also, longer tenure of office insures continuous control of major engineering operations being carried on by the army. In the past the army custom of shifting engineer officers every few years, often at the expense of the work in hand, has brought out strong protest. Such protest is heard again as a result of the projected transfer of Col. William C. Weeks from Chicago to New York. New York also does not relish the loss of Col. Barden. Both officers have been in their present stations only a few years, and both have gained experience of value to the regions they serve. When several of the senior officers at the head of the engineer list were passed over at the time Col. Brown was made Chief of Engineers the move was justified as insuring continuity of office by appointing a man who would not be due for retirement for several years. The same principle has valid application to the division and district engineers; the service would be better if they were not moved so frequently that all value of continuity of office is lost.

Indiscriminate Demands

CONCERTED demands are again coming from the federal reclamation projects that their repayment installments be postponed for the current year and for sveral years to come. Similar demand has been made by individual projects many times in the past, often successfully, though not for ten years has a general state of depression supplied so effective an argument. Many of the farmers are severely pinched, and no doubt some are in distress, but the demands are not for relief alone to those who suffer from misfortune. All ask to be included, the well-to-do, the successful farmer and the landlord farm-owner as well. Such indiscriminate demands do not enlist sympathy. They are bold attempts to borrow public money for the conduct of the private business of the reclamation regions. No great amounts are involved—not more than perhaps ten or fifteen millions for all the projects—and the demands therefore may seem a trifling affair. Fundamental principles of fair dealing are at issue, however. If government relief for the unfortunate is proper, there is every reason why their prosperous but greedy neighbors should not be allowed to profit from this helpful motive. Blanket relief to the reclamation projects is unfair and destructive.

Broader Perspective

WHEN a wave of wage-reduction sentiment is sweeping the country, as now, it is of value to turn back to other times and see how such sentiment looks in the light of a broader perspective. Less than three years ago Henry S. Dennison wrote interestingly on the subject in a chapter of "Recent Economic Changes in the United States." He compared the opposing views of 1921 and later years, and remarked that at the former date the high-wage theory as a doctrine of management had not yet been born. Wage reduction was a popular doctrine, but only for a short time. "Among operating executives the most frequent subject for discussion was the necessity for 'liquidating labor' before recovery could be expected from the depression. In 1921 more than 300 articles appeared telling of methods used in cutting wages and speculating how far they would fall. By 1922 articles of this sort had disappeared and those about wage incentives had taken their place. . . . The high-wage doctrine by 1926 had gained its present standing. Nevertheless no one can say whether its foothold is as yet strong enough to stand the strains of a long depression. Not many popular beliefs gain such strength in a half dozen years." Mr. Dennison's recital of events suggests that the 1921 wage-cutting movement was a fallacy.

abandoned just as soon as lessened pressure freed industrial management of its belief that it could save itself only at the worker's expense. Business revival and expansion were coincident with a new belief in high wages. If this passage of history repeats itself, wage-cutting may again prove a short-lived episode, perhaps to be regretted by all concerned.

Design Responsibility Made Real

A PRECEDENT that may have far-reaching results was set in the Bronx, New York City, two weeks ago, when the designer of a structure whose collapse had caused loss of life was convicted of manslaughter. Such a conviction brings home the reality of design responsibility. It may be remarked that it was only the structural framework of a coal pocket that failed; but this fact makes the case the more significant. The important point is that the courts have demonstrated that existing laws lay heavy penalties upon the designer whose negligence causes loss of life. Since the conviction goes beyond any previous legal decision affecting structural failures, its connotations are of paramount importance to every engineer.

From the standpoint of the engineering profession, the conviction is eminently commendable. Sympathy for the unfortunate designer, which every engineer will have, cannot be allowed to affect thinking on the broader aspects of the case. Nor should the fact that the whole business agreement surrounding the purchase, design and construction of the coal pocket was highly irregular cause the importance of the case to be minimized. The fact remains that the designer was convicted of manslaughter, and similar conviction could be had again in a like case anywhere.

The most obvious result of the conviction is that it places a curb on incompetent and chance-taking designers. The danger of loss of reputation has never affected such individuals greatly, since they have had little to lose in this respect. Fine and imprisonment, however, are something tangible. They will prove to be effective deterrents.

The case presents an excellent example of how not to engage engineering services. The owner "bought" the coal pocket from a contractor. The contractor in turn "bought" the design together with the steel from a local fabricator, who, having no design department of his own, "bought" a design from an individual who represented himself to be a competent designer, although he held no license to practice engineering. The net result was that the owner not only borrowed trouble, delay and extra expense but did not secure a good or safe design.

It is important to observe that it was not the fabricator who was held responsible for the failure of the structure, but the designer whom he had hired. This fact is of prime importance to every engineer, however competent. It demonstrates how absolutely necessary it is for the engineer, in the interest of his own security, to be clothed with authority to control every step of the design. No other person—whether he be owner, architect, foundation contractor or material dealer—should be allowed to dictate concerning any matter that concerns structural safety, for this is the major trust of the engineer. If by chance some designers have held this trust carelessly or lightly, the present manslaughter conviction should prove a powerful admonition.

That the effect of this case may not be ephemeral but lastingly beneficial, it should be utilized widely to strengthen the professional machinery that has been set up to guard the public safety. The designer of this coal pocket had no license to practice engineering, but his signed plans nevertheless received official approval. Three lives and the injury of eleven men constitute a heavy penalty to pay for this utter disregard of the license laws on the part of the city dock department. Fortunately, however, the manslaughter conviction demonstrates that other existing laws are adequate to cope with culpable negligence, even though license laws may sometimes successfully be ignored.

It is plain from this case that the engineering profession is charged with insisting that its members have full control over structures which they design, to the end that the culpable negligence of other parties may not jeopardize the safety of their construction. One means to this end exists in the proposed new building code for New York City, which requires that the engineer sign an affidavit at the completion of a job attesting to the fact that the design has been executed in accordance with the plans. Other cities in revising their codes would do well to give the subject of design responsibility careful attention. For the immediate present, it is the responsibility of the whole engineering profession to give thought to ways to utilize this manslaughter conviction to best advantage for itself and for the public whose safety it is charged with guarding.

State Supervision of Dams

DISASTROUS experience with the St. Francis dam, followed by the Lafayette dam slip, was accepted as proof that some new and additional agency under the direction of state authorities was needed to pass upon the safety of the large number of dams in California, existing and proposed. Accordingly, such an agency was set up under the direction of the state department of public works. It has made systematic examination of the 827 dams within the scope of the new act, by thorough field examination as well as by stress analysis and computation. Although the survey is not yet entirely complete, results thus far justify it most amply.

Of the 827 dams, roughly one-third were found to be in need of alterations, repairs or changes of some sort—frequently the removal of obstructions from spillways or enlargement of the latter. One-third were found to require further examination, such as borings, or inspection at lower water level, before final decision could be reached. *Only one-third could be pronounced definitely up to the state's requirements.* In other words, just at present only one-third of the existing dams in California can be given official approval as safe, dependable structures.

Many dams that await further examination will be approved, of course, and many of the changes required are minor. But allowing for all this, and further assuming that the state authorities have been conservative in granting approval, there still are grounds for satisfaction in feeling that somewhere in this dragnet have been caught potential dangers.

All such dangers must be caught—there must be no possibility of another St. Francis. The findings made in California concern every state having many dams. Engineering skill can never justify its responsibility to the community until the danger of dam failure has been wholly removed.

The Bankruptcy of Local Road Administration

An argument for abandoning county and townshp administration and ad valorem taxation for road improvement

By **CHARLES ROSS**
General Counsel, State Highway Commission
Raleigh, N. C.

THE BANKRUPT CONDITION of many rural counties and townships in America today is due largely to the fact that these local organizations have endeavored by ad valorem taxation to provide and care for a system of highways made necessary by the modern demands of automobile traffic. Modern local roads must be adequate not only for the local needs and the visiting city cousins, but for the trucks engaged in gathering up the country produce and distributing over a radius extending much beyond the county line the merchandise from the city merchant and the manufacturer, as well as from the town man's laundry and bakery.

The result is that, while the service and the need of the roads recognize no township or county lines, taxation still finds these lines an insuperable barrier. The improvement of highways and the coming of the motor vehicle tends more and more to concentrate wealth into the populous centers, and the small county in which the populous city is situated enjoys the benefit of an ad valorem tax upon the property for the improvement of its roads; whereas the rural county, deprived of this source of revenue by an imaginary boundary line, burdens itself with bond issues and high taxes in order to try to build a system of modern roads to meet the needs of this new mode of transportation.

In a joint survey conducted in North Carolina in 1930 by the United States Bureau of Public Roads and the state authorities, many data on the question of local roads were accumulated. From these data it appears that the ten wealthiest counties in North Carolina, with an average tax rate of 15.9c., produce a road-maintenance fund of $328 per mile for all their local roads; whereas the ten poorest counties in the state, by levying a tax rate of 32.6c. per $100 valuation, produce a maintenance fund equal only to $90 per mile. In the conclusions of the report it is said:

> Until after 1900 horse-drawn traffic, the sole user of the highways, was small in amount and the radius of travel was short. Roads, therefore, were a local problem, used by the adjacent residents, and their condition was a matter of no concern to the residents of other sections of the county. Administrative road units comprising a township are not suited to local road needs in 1930, when automobiles may cross a township in 15 min. and some counties in about one-half hour.

The justice, therefore, of placing the burden for the construction and maintenance of so-called local roads upon a source of revenue other than local ad valorem taxation is apparent. Since motor vehicles are the principal users of the roads, what more equitable system of taxation can be found for the support of the roads than a tax on the motor fuel that they consume? And what more right has the township or county in which the automobile resident lives to this tax than the neighboring township or county in which he does much of his traveling? The need for road construction and maintenance automatically adjusts itself to the volume of existing traffic.

But if the tax is to come from a general source, does it not follow logically that the supervision and management of the expenditure ought likewise to be general?

All but six of the states of the Union now apportion to the counties and townships some part of the motor and gasoline tax; but of this number only seven retain any control over the money thus distributed. In North Carolina alone the entire support of the local roads is provided for from motor vehicle and gasoline tax, and the control is centered in the state highway organization. Twenty-two states yet depend in whole or in part upon township organizations for the construction and maintenance of roads. I quote from the North Carolina survey:

> In the conditions brought to light by these companisons lies the crux of one of the most serious problems of local highway administration in North Carolina, as of other states. It is clear that the root of the difficulties springs mainly from two facts: (1) That the county unit is not sufficiently large to include areas of rich and poor development within the same administrative borders; and (2) that the area of the average county and the extent of its road mileage are not sufficient to permit of full utilization of the force and equipment required for economic highway operations.
>
> Thus, the small wealthy county is not much more favored than the large and poor county. Though the latter is likely to suffer economic loss by reason of the poverty of its equipment and resources, the former is almost equally susceptible to loss by reason of the incomplete utilization of a rich endowment.

These small units of administration, in the endeavor to meet the complex requirements of a modern road system that has been thrust upon them, have found themselves not only on the verge of financial bankruptcy but equally as poor in their effort to build up satisfactory organizations for supervision of the proper utilization of modern equipment.

When, on July 1 last, the North Carolina state highway commission found itself faced with the problem of taking care of all of the public roads in North Carolina, it immediately consolidated all of the 100 county units of operation into a state system, and divided this into 25 supervising districts, each district in turn being divided into local maintenance units ranging from 40 to 100 miles. System has now taken the place of chaos.

It is no doubt true that there are some heretofore favored localities that are not receiving quite as much attention as they did under local control, but there are no forgotten areas. It is safe to say that 75 per cent of the state is receiving better maintenance than it ever received before, and yet the cost to the state as a whole, as shown by the first four months' operation, will not exceed 60 per cent of the cost heretofore incurred by the counties.

The burden has been adjusted according to the ability to pay, and in return the fund is being disbursed according to the needs of traffic.

Can Local Road Improvement Be Afforded?

Stage construction provides a means by which any community can make a start on an all-weather road system

By HARRY J. KIRK
Manager, Construction Division, Associated General Contractors, Washington, D. C.

ANY COMMUNITY whose citizens can afford to own motor vehicles can afford all-weather roads. Two recent examples of local-road improvement stand in support of this assertion.

In 1922 Vic Donahey, candidate for governor of Ohio, said: "What Ohio needs is more roads at $10,000 per mile and less at $40,000 and $50,000 per mile." He was not exactly sure as to how this could be done, but he was certain that it had to be done. Beginning with his administration in 1923, the Ohio department of highways improved several thousand miles of road at an average cost, for the larger part, of about $3,000 per mile. Details of this work in Ohio were given in an article entitled, "Developing Traffic-Bound Roads at Low Cost," by the writer, in *Engineering News-Record* of June 2, 1927. In response to popular demand, Governor Pinchot of Pennsylvania has recently inaugurated an ambitious program, touched on elsewhere in this issue, involving 20,000 miles of local roads scattered throughout the Keystone state. It is planned that expenditures will average about $5,000 per mile.

Local Roads Can Be Built at Low Cost

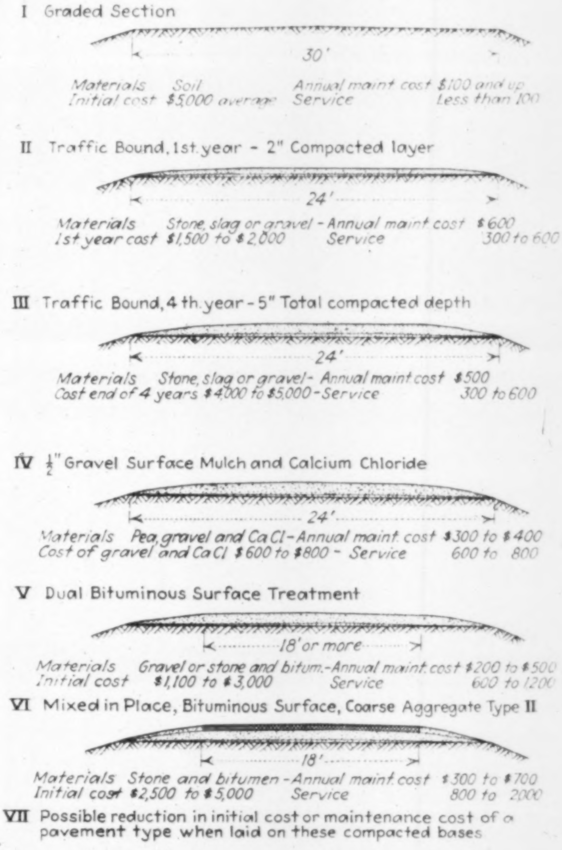
During 1926 and 1927 an intensive country-wide study of low-cost improved roads was made by C. N. Conner for the highway research board. The following quotations are from his report published in 1928:

> Untreated surfaces capable of carrying mixed traffic of 300 to 500 automobiles and light trucks daily can commonly be built for less than $10,000 per mile, with a width of not less than 18 ft.
>
> Low-cost improved roads are profitable investments, provided they are intelligently maintained and not overloaded with heavy trucks.

Attention is directed to the accompanying illustration taken from the above-mentioned "Low-Cost Road Report." The stage-construction method offers the most practicable solution of the local road problem. The idea is to work by stages, or installments, toward an ultimate high standard.

The cost of grading and drainage structures will vary widely. But even in hilly or mountainous country some slight changes from an ultimate high standard of alignment and grade can often be made to cut the cost in two. Great savings on small bridges can be effected by the use of local timber. Generally an old road grade with drainage structures in place and more or less adequate, exists as a starting point. It is always best, no matter how small the funds available, to start, that an ultimate plan of alignment and grade be worked out. The prime necessity, however, is an all-weather surface, which can be had as shown in the figure for $1,500 to $2,000 per mile. If only this amount is available, other desirable features will have to be withheld and the all-weather surface purchased first. The greatest return in traffic service for the funds expended is found in the transition from a mud road to an all-weather surface, even where the latter is laid to an alignment and grade that may later be largely abandoned. It will always be found that mud-bound communities will be so pleased with even the minimum of an all-weather surface that the raising of funds for further stages of improvement will be made much easier.

It is a fallacy to say that local roads must remain unimproved because it costs too much to improve them. A start can always be made, using the stage-construction method, if only on a very limited local system.


I Graded Section
30'
Materials Soil Annual maint. cost $100 and up
Initial cost $5,000 average Service Less than 100
II Traffic Bound, 1st. year - 2" Compacted layer
24'
Materials Stone, slag or gravel - Annual maint. cost $600
1st year cost $1,500 to $2,000 Service 300 to 600
III Traffic Bound, 4 th. year - 5" Total compacted depth
24'
Materials Stone, slag or gravel - Annual maint. cost $500
Cost end of 4 years $4,000 to $5,000 - Service 300 to 600
IV ½" Gravel Surface Mulch and Calcium Chloride
24'
Materials Pea, gravel and CaCl - Annual maint. cost $300 to $400
Cost of gravel and CaCl $600 to $800 - Service 600 to 800
V Dual Bituminous Surface Treatment
18' or more
Materials Gravel or stone and bitum. - Annual maint. cost $200 to $500
Initial cost $1,100 to $3,000 Service 600 to 1200
VI Mixed in Place, Bituminous Surface, Coarse Aggregate Type II
18'
Materials Stone and bitumen - Annual maint. cost $300 to $700
Initial cost $2,500 to $5,000 Service 800 to 2000
VII Possible reduction in initial cost or maintenance cost of a pavement type when laid on these compacted bases

System of stage construction of local roads

At first it may be possible to spend only a few hundred dollars a mile on grading and minor drainage structures. Here every yard of earth moved can be made to fit in the ultimate plan.

The success of this stage-construction method depends much on intelligent maintenance. The budget should provide a fund for keeping the surface smooth and patching weak places as they develop, even at the sacrifice of other things.

State road systems have been laid out with the idea of serving the most pressing traffic needs. Local road improvement should follow the same principle. The community dollar will do the most good when spent first where traffic needs are greatest. Such a policy will foster a healthy public sentiment that will support the tax measures necessary to raise revenues. Not every mile should be improved simply because it is a public road. Many miles could be abandoned, and the money now frittered away on their upkeep could be used to better advantage on a more limited local system.

A knowledge of traffic movement and traffic needs is as necessary in the intelligent planning of a local road system as in a state system. States could aid local road improvement materially by conducting traffic surveys of county systems and supplying the data necessary to the rating of routes in the order of importance. New Jersey is doing this very thing. In consequence of legislative action all roads are being classified. State aid will be granted to routes in the order of their importance.

There was a time when all road expenditures had to be met by taxes on real estate. With the growth of the motor-vehicle license fees, and more particularly the gasoline tax, the financing of state highway programs began to depend less and less on property taxes. The next step was to appropriate a part of state motor-vehicle taxes for use on local roads. Today we find that in most states the expenditures on many routes come exclusively from federal aid and motor-vehicle revenues, and that a part of these latter are given to meet local road budgets. State aid on local roads can be supported on much the same principles as federal aid on many state routes. As a matter of fact, in many poor areas it would be impossible without state aid to make headway on local road improvement.

Low-Cost Roads Create a Desire for the Higher-Cost Types

Poor communities burdened up to this time with mud roads are not going to jump overnight to expensive pavements. The first objective is to get them out of the mud. Once out of the mud there will soon be heard mutterings of a new cry, "Out of the dust!" Conditions as to finances and traffic may dictate that the next step should involve the use of bituminous materials in one of the many inexpensive methods that have been developed in the past few years. The writer has seen this transition from lonely mud roads, run-down farms and ill-kept farm buildings, first to an all-weather gravel surface later made unbelievably smooth with a tar or asphalt treatment and finally replaced with a fine hard-surfaced pavement, farm houses painted, yards cleaned up, fences repaired—a transformation beyond the imagination of the most enthusiastic good-roads advocate, and all within a period of six or seven years. By no other means could a desire have been developed so quickly for the more expensive type of construction, and at the same time build up among taxpayers a willingness to pay the extra taxes necessary to pay the cost of the new improvements.

Local Road Improvement as Unemployment Relief

Road work of every kind has proven most useful as an unemployment relief measure. It can be applied to practically every locality. It permits the laborer to stay at home, which is a very desirable feature. In this respect the low-cost improved road on local routes has great possibilities. From its very nature local short-haul materials must be utilized to a maximum for surfacing. The same is true of bridges and culverts on such operations; and as for grading, everything except a charge for equipment goes into local pay checks.

Almost every cent spent in this manner for local road improvement will be returned to those living in the immediate vicinity either as direct payment for work on the job or for materials furnished.

Just one note of warning is given here to those doing this sort of work. There is an apparent difficulty in contracting the grading of low-cost roads due to the high proportionate cost of plans. A thorough and sympathetic study will probably reveal methods of taking competitive bids and proceeding by contract at a saving over the direct-labor method followed in many instances. The latter involves heavy investment in large equipment. A public official cannot be given a task more fraught with trouble, no matter how able and honest he may be. than responsibility for a large purchase of equipment. Furthermore, the ownership of this very equipment may perpetuate a day-labor organization long after its original purpose has been served. This will involve a waste of public funds and the inevitable repudiation of those responsible for its continuance.

Road mix on fine-sand soil

The Local Road Today

Its physical condition and present traffic—The traffic service it renders and the improvements that are needed

By THOMAS R. AGG
Assistant Dean, Division of Engineering, Iowa State College, Ames, Iowa

THE PREDOMINATING TYPE of road surface on local highways is the natural soil of the area in which the road is located. These natural-soil roads vary from excellent to the poorest of unimproved trails. While the natural-soil type predominates, one may find a wide diversity of types of all-weather surfaces on these secondary roads. Sand-clay, gravel, macadam, oil-treated gravels and macadam, shale, shell, low-grade iron ore, straw, cobs, sawdust, refuse of various kinds and any other material that anybody could conceive of as being useful as a road surface have been tried out on these highways. Of course, the sand-clay, macadam and gravel predominate, and the mileage of other types is a negligible part of the whole. Some excellent rigid pavements, such as concrete, brick and the bituminous types, are found on the roads in this group, but the mileage is relatively small.

A consideration of what has been accomplished toward the improvement of the surfaces of the roads in this class leads to the conclusion that, in planning for the future, most states must proceed on the presumption that little or no wearing surface of value exists on the secondary roads. Of course, there will be isolated sections of good surfaces here and there and in some counties a considerable mileage of fair-surfaced roads, but in the main very little has been done of a really permanent character. It is not intended to belittle the efforts that have been made in certain states to correlate the work of the township or county boards with that of the state highway department; in some instances great progress has been made. A little group of states, perhaps a dozen in all, have really made some progress toward the solution of this problem. In those states a considerable mileage of a fair quality of surface of an all-weather character will be found on secondary roads.

Knowledge of Traffic Is Lacking

There have been very few traffic surveys undertaken on the roads of the secondary system. In some of the more populous counties the traffic records are available, and they cover the main traveled roads in the county systems. These, however, are of little importance or significance in connection with the problem under consideration, because they are taken on highways carrying traffic comparable with that on many parts of the state trunk-line systems. When consideration is given to the typical secondary roads, it must be recognized that quantitative evidence with reference to the volume of traffic is entirely lacking. The impression prevails that there are a good many miles of highway in this system that do not exceed ten vehicles per day as a year-round average. At the other extreme it will be found that on a considerable mileage of the more important roads in this system, but with outside metropolitan influences, the traffic reaches 1,000 vehicles per day. The development of a comprehensive plan for the improvement of this road system should take into account the exceedingly variable traffic load, and should provide a diversity of types and designs to meet each traffic condition at the lowest possible cost.

In most parts of the United States motor vehicles predominate on this system of roads, but there is a considerable volume of farm-to-farm traffic that is animal-drawn, and a certain amount of farm-to-market traffic that is also animal-drawn. As in the case of the state trunk-line system, it is probable that the animal-drawn traffic would largely disappear from the secondary road system if all-weather road surfaces were provided so that motor vehicles could operate the year around. There would continue to be a small amount of farm-to-farm traffic of the animal-drawn type, but the amount of this would be relatively unimportant.

These roads carry automobile traffic principally, but there is an admixture of light delivery-truck traffic developing. It is in this direction that the increase in traffic would come if these roads were improved.

It is quite apparent that even the most liberal allowance for average traffic on roads of this class indicates that very rigid and painstaking analysis of the problem will be required to determine what type of surfacing it will pay to employ. There can be no doubt, however, that the traffic will justify laying surfaced roads of a substantial character on a considerable mileage of these secondary roads, and that light surface-treated types of all-weather construction will be justified on a very large additional mileage.

Width and Alignment Unsatisfactory

The right-of-way now existing for these secondary roads varies in width from 2 to 4 rods. Throughout the Middle West 4 rods, or 66 ft., is the common right-of-way. In the Eastern third of the United States and in the South a great many roads have been laid out with about 40 ft. of right-of-way; and in the mountainous sections of the country, both in the East and in the West, the right-of-way varies in width and is not clearly defined, but is generally just sufficient to permit the grading of a trackway for traffic. As a rule, the width of right-of-way is ample to provide for the necessary earthwork incident to the adequate development of these roads, although in some areas where relatively heavy earthwork will be necessary, some additional width might be required. On the other hand, there are many areas in which there is an excess of right-of-way, part of which should be returned to the owners of the land and placed under cultivation, so as to keep down the row of noxious weeds that make the road unsightly and seed the adjacent farmlands.

The alignment in the prairie regions follows the section and half-section lines, but in the regions of hilly or mountainous topography the alignment was determined by the necessity for securing reasonable grades for slow-moving vehicles. Consequently in many places the alignment is wholly unsatisfactory for motor traffic, and extensive relocations would be required in many regions. These will not be in the nature of general relocations of the whole highway, but will be betterments at dangerous corners and sections where the grades are unsatisfactory.

The roads of this class were originally located with a view to giving the settlers an outlet to market, and, in general, existing locations are satisfactory from the standpoint of giving traffic service. It is quite probable, however, that a careful study in any area would show that there are possibilities of eliminating a considerable mileage of these roads and at the same time giving the farmers an adequate outlet to market. Doubtless a considerable saving in the final cost of construction could be effected by such revisions over the cost that would be entailed in improving the roads as they exist today. Such a situation is a natural outcome of the hit-or-miss basis upon which these roads were orginally located.

These roads afford a means of communication to an exceedingly important part of the population of the country and accommodate the trickle of traffic that converges in the market towns, carrying the flow of foodstuffs from the farm to the consuming centers. Consequently, the importance of the traffic on these highways should not be measured so much by the volume as by the value and importance of the commodities that are thus marketed. The adequate improvement of this section of the transportation system of the country will be the final step in providing a network of highways to serve all of the people in all kinds of weather and for all kinds of traffic. The problem far transcends in importance the apparent significance of the thin stream of traffic that moves over any one of these highways. This traffic constitutes the very life blood of commerce in the United States, and its importance cannot be too greatly magnified.

Road-mix gravel road in Wyoming

Improvements Poorly Made

On the great bulk of the mileage of these roads the improvements consist of the ordinary blade-grader shaping, whereby a ditch is provided along each side of the traffic way and the roadway surface itself is built up from soil drawn in to form the cross-section of the highway. In too many cases this trackway consists of a heterogeneous mixture of clods and sod, no very consistent effort being made to provide a smooth and usable surface. There has been some improvement in this respect during the past ten years; but after due allowance for the excellent work done in some directions, it must be said that the average attempt to "grade" one of these secondary roads is an exceedingly crude attempt at roadbuilding.

The equipment available is generally adequate to the task, but the supervision is casual and the actual operation inexpert and careless. The depreciation rate on the equipment is very high because of the conditions of service.

In any state where the drainage structures for the secondary roads have been constructed without supervision or plans from the engineering organization of the state highway department, there is an exemplification of inefficiency and waste running riot. There has been almost no correlation between the size of drainage structures provided and the actual capacity required. Culverts and bridges are either too large or too small in many cases, but the common tendency has been to employ drainage structures with entirely too great hydraulic capacity. There exists on this system of highways a great many drainage structures of some age whose load capacity is considerably below the requirements for the traffic that is to be expected when reasonable all-weather surfaces are provided. One of the heavy expenditures that will be necessary in bringing up the standards of this road system will be that for bridges and culverts, since probably more than half of the drainage structures that now exist will need to be rebuilt within the next ten years if adequate road service is to be rendered.

It is but natural that efforts have been made from time to time to improve the grades on these roads. This is due to the fact that the people who use the roads were continually complaining about the bad grades on certain sections of the road, and highway officials could make a favorable impression by reducing these critical grades. Like all other improvements on this system of highways, there has been no uniformity in the standards, such as width and maximum grades, nor any very accurate study of what is required. Wherever rough topography exists, it will be found necessary to make extensive grade revision on this system of roads before it will adequately serve the traffic that is expected to come upon it.

Summary

Secondary roads of the United States comprise a system in excess of 2,400,000 miles, of which not more than 10 per cent has been improved with reasonable grades, drainage structures and adequate all-weather surfaces. On the rest of the system such work as has been done up to the present time has been of piecemeal character on such portions of the system as seemed most expedient in a particular year. No adequate record of the present financial status is available, but it is known in a general way that an enormous burden of debt is carried for the system. The traffic is comparatively light both as to numbers of vehicles and the weight of the vehicle and load, but the commodities carried over these roads consist principally of foodstuffs vital to the national life.

The improvement of this system of roads to meet the needs of the traffic over it should begin at once and should be carried along as rapidly as it can be organized and financed, because not until the problem of the secondary roads has been satisfactorily worked out can we say that the highway system of the United States has been improved to meet the needs of her people. This problem is destined to be persistently presented to the highway engineers of the country in the future until an adequate solution has been worked out and a program of improvement embarked upon. Any organized effort to promote an early start on the task is most emphatically in the public interest. If haphazard legislation is permitted by lack of organized action, the public is likely to pay heavily for misguided effort.

Current Activity in Local Road Improvement

Increasing funds for local roads, with reduction of administrative units and centralization of planning, promise active secondary-road programs in coming year

By CHARLES E. GRUBB
Engineer-Executive, County Highway Officials' Division, American Road Builders Association, Washington, D. C.

UNTIL RECENTLY, counties and townships principally ~~have~~ coped with local road problems. The handicaps to general progress have been primarily in large mileage, too many administrative units for effective operation and inadequate finances.

Many counties, however, have planned, developed and maintained satisfactory highways efficiently and economically. Their personnel has been of the highest qualifications and has been retained in continuous service over extended periods. These counties have demonstrated the advantages of correcting existing weaknesses in other counties and providing additional finances for their operation. On the other hand, exceedingly few townships have been effective in highway affairs.

Recent Developments

Recent developments in the administration and financing of local roads are reviewed here through reference to statistics showing a comparison of disbursements for the years 1924 and 1930, the increase in distribution of gasoline taxes and motor-vehicle registration fees for local roads for the same years, the progress in local road improvement during 1930, the status of local road improvement at the end of 1930, and the engineering status of counties and townships.

Disbursements—Disbursements for local road improvement have increased from $575,856,908 in 1924 to $851,686,625 in 1930. In 1924 $62,567,876 was expended for principal payment on bonds; and in 1930 $112,576,447 was spent. Also in 1930 $38,614,930 was transferred from the counties to states for work on state roads. The net for 1924 then was $513,288,032 without deductions for state construction. For 1930, with deduction for transfers to the state, the net was $700,385,224.

An analysis of these local road expenditures shows that substantial increases have occurred in twenty states. Expenditures have actually decreased in eight states. In the remaining twenty states 1930 expenditures are slightly, but not greatly, in excess of those for 1924. The states having the largest expenditures for 1930 are Pennsylvania, New York, Ohio, Michigan and Wisconsin. Together these five spent 35 per cent of the total local disbursements for the year and 42 per cent of the portion thereof that was spent for construction. The fact that expenditures were so concentrated indicates that, as further development occurs and improvement is made in administrative procedure, the local roads in other states will probably receive considerably larger sums than at present.

This expenditure for local roads may appear large when compared with the total expenditure of $979,997,847 for state highways during 1930. The latter, however, produces the spectacular showing because it is concentrated on newly constructed systems of highways requiring relatively small expenditures for maintenance and containing but 324,000 miles—a mileage equal to about one-eighth of the mileage of local roads.

Distribution of Motor-Vehicle Taxes—From 1924 to 1930 the distribution of funds by the states to counties and other local units of government has increased greatly due to the increasing returns from gasoline taxes and motor-vehicle license fees and the nearing completion of the state systems. The amount returned to the counties and other local units in 1924 was $44,000,000, and in 1930 it was $164,000,000. This latter sum represents distribution by 40 states. These sources of funds account in a very large measure for the recent increases in local expenditures for highway improvement, and the indications are that funds from these sources will continue to increase during the next few years.

1930 Improvement Progress—Counties and townships, according to the statistics available, improved 52,440 miles of highway during 1930, of which 25,169 miles was surfaced with gravel, 4,470 with sand clay, 2,084 with water-bound macadam, 2,175 with bituminous macadam, 486 with bituminous concrete, 1,441 with cement concrete, 59 with brick and two with either asphalt or stone block. The remaining 16,507 miles improved during the year was graded and drained only.

In each of the eighteen states the counties and townships improved more than 1,000 miles, and in nine of these the unit totals exceeded 2,000 miles. The counties of Iowa lead the list with 5,237 miles, of which 3,380 miles was of graded and drained classification and 1,836 miles of gravel. The largest mileage of improved surfacing was reported for the local units of Minnesota, with 3,315 miles of gravel or better out of a total of 4,812. In each of the three states of Pennsylvania, Michigan and Illinois the local units constructed more than 200 miles of cement concrete.

It is significant that the progressive type of construction predominates. Attention to drainage followed by the construction of a low-cost surface appears to be the popular practice. The greatest contribution toward local road improvement apparently has been the development of a satisfactory low-cost road surface. This type predominates not only in the current construction but also in the totals showing the status of local roads to the end of 1930.

At the end of 1930 local roads showed a total surfaced mileage of 467,338 miles, of which 425,742 was of the low type, such as sand clay, gravel, water-bound macadam, and 41,596 of high type, such as bituminous macadam, bituminous concrete, portland cement, and brick or other block pavement. The total mileage of earth roads was 2,217,232.

An appraisal of county and township administration, based upon reports of district engineers of the Bureau of Public Roads which appeared during 1929, sums up the character of control exercised by the county and township officials at that time in the following words:

> There are 3,066 counties or similar governmental subdivisions in the United States, 67 of which are in New England and have no significance as units of highway administration; 1,731, or 57 per cent, of the remaining 2,999 counties have some degree of engineering control of road construction or maintenance. In 1,115 of these, or 37 per cent of the total number, there is reasonably competent engineering control of highway construction; and in 975 of these, or 32 per cent of the total, the control of road maintenance is reasonably competent. There are 829 counties in which there is no definite organization for road maintenance, and the work is casual and inefficient.
>
> With few exceptions roads under township jurisdiction are administered ineffectively and inefficiently.

These figures were compiled in 1929, since which time there have been many advances in local adminstration, particularly as respecting counties, but they are sufficiently recent for the conclusion that there is room for considerable improvement. There is need for more nearly general realization of the benefits of engineering direction and the importance of planning. On the other hand, these figures show at least 32 per cent of the counties have risen on their own initiative to a degree of excellence to be credited as having reasonably competent engineering control.

What has been done in these progressive counties with considerable success and profit can be duplicated in many other counties with an approach to their success. Perhaps for more effective operation, some counties in the more sparsely populated areas and certainly most of the townships should be consolidated into suitable units to support adequate engineering organizations. Highway engineers with executive ability are needed in additional counties today and will be in greater demand as county development progresses further.

Plans for State-Wide Activity

The present activity is attracting national attention because of the state-wide character of present plans. Each plan tends toward centralization of highway authority; coordination of planning for primary and secondary highway systems; better business methods, particularly as to accounting practices; competent engineering supervision; standard construction; regular and systematic maintenance, and a better distribution of highway funds. The greatest differences between the plans are in respect to the administrative unit that will conduct the programs of improvement, or as to the relationship between the several units that will share the responsibility for them.

It would hardly be possible to establish a uniform system of financing for 48 states and 3,000 counties, with their varying degrees of highway completion, population, wealth and laws; yet if many of the unfavorable elements now existing are eliminated, financing methods will be greatly improved, much dissatisfaction will disappear, and the building of a patchwork system of highways will be impossible.

Townships

There is a definite trend toward elimination of township units in highway administration, because generally these units have been found to be too small for competent and effective administration. At present the township highway organizations are found in a number of the Eastern and Mid-Western states. In New England there is a form of town organization that takes the place of both the townships and counties of other states and administers for local highway needs. In 34 states through the Southern and Western part of the country townships do not exist or have no jurisdiction over highways. The latest state to join this group is Iowa. Iowa set aside township administration of highways in January, 1930, and concentrated authority for all roads outside of the state system in the county boards.

Also among the eighteen states that retain township administration in whole or in part, townships are being relieved of highway affairs in several instances. Recent legislation in Michigan provides for the transfer of roads to counties over a period of five years, with 20 per cent to be taken over by the counties each year. In Illinois the township unit in sixteen counties has been relieved of highway administration, and the county operates for all local road administration. In Nebraska 48 counties out of a total of 93 have abolished the township in highway affairs. In Oklahoma some counties have eliminated the township organization entirely. In these and also in most of those retaining the township unit for other local needs, highway affairs are generally directed by county officials.

Local Funds for State Highways

The practice of utilizing local funds for state highway construction is condemned by highway economists as unsound, and it will probably be discontinued gradually. It has resulted in counties in some states being handicapped in caring for local highways, because county funds have been used to match federal aid or for state construction of primary or trunk-line roads. In some states the counties were encouraged to issue bonds against the credit of the county to provide funds for state construction. These bonds are now generally outstanding, as in Iowa and Ohio, and remain as an obligation of the county, serving as an obstacle to prevent the counties from initiating local road improvement programs. During 1930 counties in Texas contributed $10,000,000 toward state highway work; in Kentucky $10,500,000; in Oklahoma $2,300,000; in Wisconsin $6,500,000; and in Florida $1,800,000. The elimination of this financial drain upon the county would remove an obstacle that has retarded local road improvement wherever it has occurred.

Conclusions

The foregoing instances, which are cited to indicate the trends in administration and finance of local roads, embody many excellent features, but possibly all can and will be further improved.

The recent developments are marked by increasing funds, particularly from gasoline taxes and motor-vehicle registration fees. The outlook in this respect is that additional funds from these sources will be made available as state systems approach completion.

The county is destined to play an important part in future highway affairs.

The majority of the present plans take into full account the high degree of administrative excellence attained by the more aggressive urban and rural counties. They recognize the advantages of increasing the effectiveness of this operating unit and establishing county planning as a policy in every jurisdiction. Generally, too, it is apparent that county absorption of township and other local roads is in progress.

Simplification of the highway administrative structure, by reduction in the number of highway operating units and centralization of planning, is thus taking place. The abandonment of necessary roads, the concentration of available funds on a restricted mileage of continuous systems; budgeted programs providing for an orderly development of highways suited to traffic needs; and provision for adequate maintenance, all under the direction of competent engineering supervision, are under way.

The most gratifying feature of the whole movement, which is gaining headway, is that the consolidated experience of the federal government, the states and the counties is being applied to the solution of the local road problem.

Materials for Low-Cost Roads Are Widely Diversified

Many types of surfaces developed to permit widest possible use of cheap local materials—Construction methods and equipment available for all types and materials

By J. T. PAULS
Senior Highway Engineer, Bureau of Public Roads, Washington, D. C.

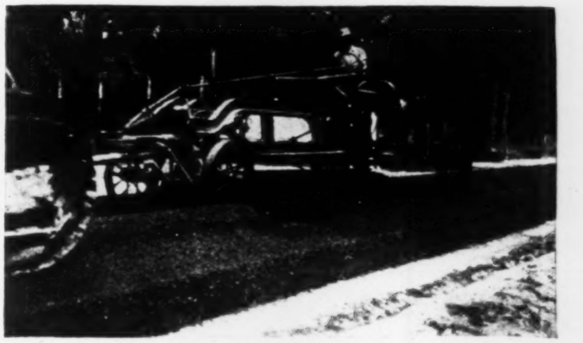
A TRUE PICTURE of the progress made in the field of low-cost road construction is shown only in part by the number of miles of roads built. The development of methods, equipment and materials for use in this type of work has gone hand-in-hand with the actual construction, and in a sense is of equal or greater importance than are the actual miles built. It is now possible to plan and build low-cost roads with a definite knowledge of the results that can be expected for a wide range of local materials and conditions. By making use of the information developed during the past few years in connection with the construction of low-cost roads, it can be confidently predicted that better construction with a wider use of various kinds of local material, as well as greater progress in miles built, will be the result in the future.

Classification by Types

Because of the diversified conditions under which these roads have been built and the necessity of making the greatest possible use of local materials, a great many types of construction have been developed. These have often been named locally, with the result that in some cases similar types of construction are known by different names in different parts of the country. This has led to some confusion and considerable difficulty in comparing results. For this paper an attempt has been made to arrange the various types in some sort of groups, although it is realized that considerable difference of opinion as to how this should best be done might logically be expected. Due to limited space it will be necessary to deal rather generally with the subject, considering only the more important types of construction and materials.

Bituminous Course Surfaces—Under this group might be placed all types of bituminous surfaces built to a thickness of 1 in. or more, using aggregates ranging from the open to the close graded types with the mix or penetration method of construction. Among the more important types in this group are: mixed-in-place, plant mix, retread and penetration construction.

Bituminous-Treatment Surfaces—This group includes those types that are built 1 in. or less in thickness, involving a wide range of methods and materials. Among these treatments would be the dust palliatives, thin mixed mats, blotter treatments and surface treatments.



Normal blade mixing procedure for retread or road-mix bituminous surfaces

Mixing with steel drag in retread construction with very coarse stone

Non-Bituminous-Treatment Surfaces—So far the development of methods and materials for use in this type of construction has been rather limited. The most important is the calcium chloride dust treatment.

Untreated Surfaces—Of the more important types of construction placed in this group are the sand-clay, top soil, gravel, crushed gravel and rock, slag, marl, etc.

Bituminous Course Surfaces

A favorite type, and one that is used extensively at this time, is the bituminous-mat construction. This type includes such well-known methods of construction as the mixed-in-place, the plant-mix and retread. Some confusion is possible in distinguishing between the retread and some of the other mix types, particularly if one considers only the method of construction. The name retread is quite generally used in the Eastern part of the country, while the Western term mixed-in-place is best known in connection with the light-oil-mixed crushed-gravel and stone construction built extensively in that part of the country. The essential difference between the two is that in the retread an open-graded aggregate is used in the mix course, necessitating generally a key course and a seal treatment, while the mixed-in-place type is predominantly built with a close-graded aggregate. Although the size and grading of the aggregates for both types may range considerably, the distinction noted above seems to hold generally for work done up to this time.

Retread Construction—The retread type has been built extensively in Indiana, Kentucky and recently in many other Eastern and Mid-Eastern states to provide the surface-wearing mat for many types of roads that possess sufficient supporting qualities but are lacking in wear resistance and surface stability. It consists essentially of mixing together on the road or in a plant an open-graded crushed aggregate with a quick-hardening (cold or warm) application material to form the mix mat, which is later keyed and sealed. The crushed aggregate used differs in size somewhat in different localities. Indiana uses a very coarse material, while elsewhere $1\frac{1}{2}$- to $\frac{3}{4}$-in material seems to be most generally used for the mix course and $\frac{3}{4}$ to $\frac{1}{4}$-in. for the key and seal treatments. Tar, asphalt emulsions and quick-hardening cutback asphalts are used in this type of construction. It is necessary for the bituminous material to harden quickly and develop high bond and adhesive properties in the road. For this reason road oils or asphalt cutback with a slow-drying solvent, such as kerosene, do not prove satisfactory. An application of light tar or other satisfactory priming material is generally applied to the base in order to provide a surface to which the mat will adhere more readily.

Spreader boxes give uniform layers of plant-mix materials

Mixed-in-Place Construction—For the mixed-in-place or road-mix construction the aggregate may be sandy soil or highly decomposed rock, such as granite or some one of the prepared crushed materials. In the Western states crushed gravel or stone, to which fines (such as silt or granular material) are sometimes added to increase the material passing the 200-mesh sieve, has been used extensively with the light road oils. Although road oils have been used most extensively in this construction, more recently cutback asphalts of both the kerosene and naphtha types have come into use in sections having unfavorable moisture and weather conditions, because of the greater resistance to the action of moisture possessed by these heavier materials. In the case of very fine-grained materials, such as sandy soil, experience has shown that it should contain at least 80 per cent of well-graded sand particles, and that with a very fine material a surface treatment is generally necessary to provide satisfactory wear resistance in the surface. This is particularly true when a type of bituminous material is used which hardens to give a hard mat. In any event, whether a fine or coarse-graded material is used, it is desirable that the material should possess high interlocking stability. However, deficiency in this respect may often be overcome by the use of a heavier type of bituminous material.

Light blading and drag brooms give even spread of cover material for surface treatments

Plant-Mix Construction—The plant mix, as far as it concerns the low-cost type, is a development of the mixed-in-place or road-mix method. The plants now in use generally provide for heating the oil and drying the aggregate when necessary, as well as some screening and proportioning of the materials. The low-cost plant mix should not be confused with the hot-asphalt plant product, as in the former only liquid asphaltic materials are used. These are similar to the ones used in the mixed-in-place and retread work, except that they are generally of a higher consistency. This is possible with the method described, since only spreading and compaction are required on the road after placing the mix. This method has some advantages over the mixed-in-place method. Less time is lost in wet weather, better proportioning of the material is possible and a heavier grade of bituminous material may be used. The advantage of using a heavier oil is coming to be recognized as of great importance due to the better behavior of these materials under conditions of moisture and severe climatic conditions.

A type of portable mixing equipment, designed to scoop up the aggregate windrowed on the road, mix and place the material in a windrow, or spread to a desired depth over the surface of the road, has been tried out on several projects during the past year. This equipment seems to offer considerable advantage, combining as it does the best of both the plant and mixed-in-place methods.

Penetration Construction—The penetration type differs from the mix construction, particularly as the name infers and also in that the aggregate used is generally of a larger size and of an open grading. Aside from some surface blading and brooming, which is generally done to insure good riding qualities, no mixing is done. As in the more open retread mix the surface is given a key course and a seal treatment. A considerable mileage of these roads has been built, particularly in Pennsylvania and Ohio. The base construction required is similar to that necessary for the mix-course type. Both cold- and hot-application bituminous materials are used. The same cold-application materials that are adaptable to the retread construction are suitable for this type. For the hot-application materials both tar and asphalt are used. The cold-application material has the advantage over the hot material in that it allows for the use of light surface blading and drag-brooming of the aggregate after applying the material, which results in smoother riding surfaces. This is of considerable importance in the construction, in view of the insistence of the public for roads with good riding qualities.

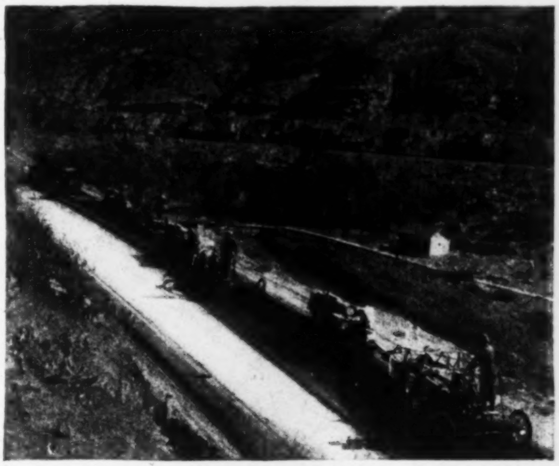
It may be said in regard to the riding qualities of the low-cost roads as now built and maintained that they compare favorably with the high-cost types. The facts are that in many sections they are being built so well that they have superior riding qualities, which have made them a favorite with the traveling public. The methods and equipment used in the construction of the low-cost types make it possible to secure a good riding surface, and when this is not obtained it is very probable that the work was not done with the best methods and care possible.

Bituminous-Treatment Surfaces

In this group is the dust-layer treatment, which is used extensively on soil, traffic-bound gravel and crushed-stone roads to alleviate the dust nuisance. The procedure in construction is generally to apply the oil to the surface, and surface-mix or drag, thereby incorporating the oil more thoroughly into the surface material of the road. When a strictly dust-layer treatment is desired, the oil used is generally of a very light grade and is slow-drying. In many cases, however, particularly on traffic-bound gravel or stone roads, the purpose is also to build progressively a surface mat. In this case a somewhat heavier oil is used. In connection with the latter type of treatment, it has been found necessary to have the surface free from excess dust, otherwise the mat will be unstable and tend to ravel, pothole or shove. This is due to the instability of the material, which is not greatly strengthened by the addition of the light oil. Since the margin between the amount of oil that will cause raveling and shoving narrows rapidly as the size of the aggregate particles become finer, shoving or raveling generally results where the treatment is applied to a very dusty surface. The best plan is, therefore, to blade off the excess dust particles so that the oil may be combined with more of the coarser particles underlying the fine dust material.

Light oil treatment of soil roads, to make them suitable for all year traffic, has been attempted with considerable success in many sections of the country. Examples of this work are the sandy-soil oil-mix roads on Cape Cod, Mass., the oil-treated roads of Illinois, Missouri, and those in Fresno and Stanslaus counties, California. There is considerable difference in the construction method used, as well as in the character of the soil, which ranges from a material possessing considerable plastic properties to those soils that are non-plastic and composed largely of granular particles. The bituminous materials used are generally road oils differing, often fundamentally, only in consistency and asphalt content.

The method of construction differs considerably, depending on the type of soil and purpose of the treatment. Generally, the work is done progressively over a period of years. This method has the advantage that improvement of the surface is brought about in conjunction with maintenance and with very small additional cost. An example of the method and materials used in this construction is given by the following outline of work done in Massachusetts, which is also quite similar to the procedure used in California.



Disking and blading outfit preparing mixed-in-place surfacing

1. Shape and consolidate the soil road.
2. In the first year apply $\frac{1}{2}$ gal. per square yard of 45 per cent road oil. No cover is added.
3. Second year, smooth the surtace by honing or blading, and then repeat first year's oil application followed by honing or surface blading.
4. Third year, hone or blade the surface after which apply $\frac{1}{3}$ to $\frac{1}{2}$ gal. of 60 per cent road oil, followed by honing or blading.
5. Fourth year, repeat the preceding treatment, using about $\frac{1}{3}$ gal. of 85 per cent road oil
6. Fifth year, repeat the fourtn year treatment.

This completes the construction, and retreatments are not expected to be necessary except at very long intervals.

The blotter treatment is another type of low-cost treatment that has proven successful for certain types of soils. It was originally developed for use, primarily, on certain types of heavy clay soils typical of those found over large portions of Minnesota and the adjoining states. The success of the treatment is based on the fact that these heavy clay soils do not take in any appreciable amount of moisture from below and from the surface except upon manipulation by traffic. The function of the treatment, therefore, is to provide a thin surface that will keep the surface moisture and traffic from immediate contact with the surface of the soil.

Briefly described, the method of treatment, as developed in Minnesota, is essentially as follows:

1. The clay subgrade is first shaped and compacted under traffic and should be practically dry and free from dust at the time of applying the treatment.

2. Application of ⅓ to ½ gal. of a highly penetrating non-volatile road oil is allowed to penetrate into the soil for at least 24 hours.

3. A second application of the same oil at about the same rate is followed by blading about 75 lb. of fine gravel over the surface.

4. The surface is dragged or lightly bladed, frequently with the addition of fine gravel to provide for a thin floating coat of dry material. In addition to this type of maintenance, light treatments are added yearly for two or three years successively to thicken and strengthen the surface.

Surface treatment is probably used more extensively than any of the other types in providing wearing surfaces for many types of base and surface construction. The tendency during the last few years in this construction has been toward the use of cold-application bituminous material, particularly on retreatment work. Probably the most important development in connection with this construction is the use of broom drags, blade machines and other means of smoothing the stone cover. This has greatly bettered the riding qualities of this type. The use of the drag or mix retreatment, recently developed, is also of great benefit in smoothing up old surfaces that have become rough.

Non-Bituminous Surfaces

In the class of non-bituminous surfaces the calcium chloride treatment for dust prevention is probably the most important. Calcium chloride owes its value, in this treatment, to the property by which it absorbs moisture from the atmosphere. In most cases the material is distributed over the surface of the road at the rate, for the first application, of 1 to 2 lb. per square yard. The distribution is sometimes made by shovels, but it is more effectively accomplished through the use of some type of mechanical distributor, such as a fertilizer spreader. The salt may also be applied in solution, using a highway sprinkling wagon.

Owing to the solubility of calcium chloride, it is gradually removed from the road surface by the action of rain, and it is, therefore, necessary to make occasional retreatments, the number during a season depending largely on the climatic conditions. When the weather is exceptionally dry, the calcium chloride may not be able to get sufficient moisture from the air to dissolve. In such case it is best to apply the material dissolved in water.

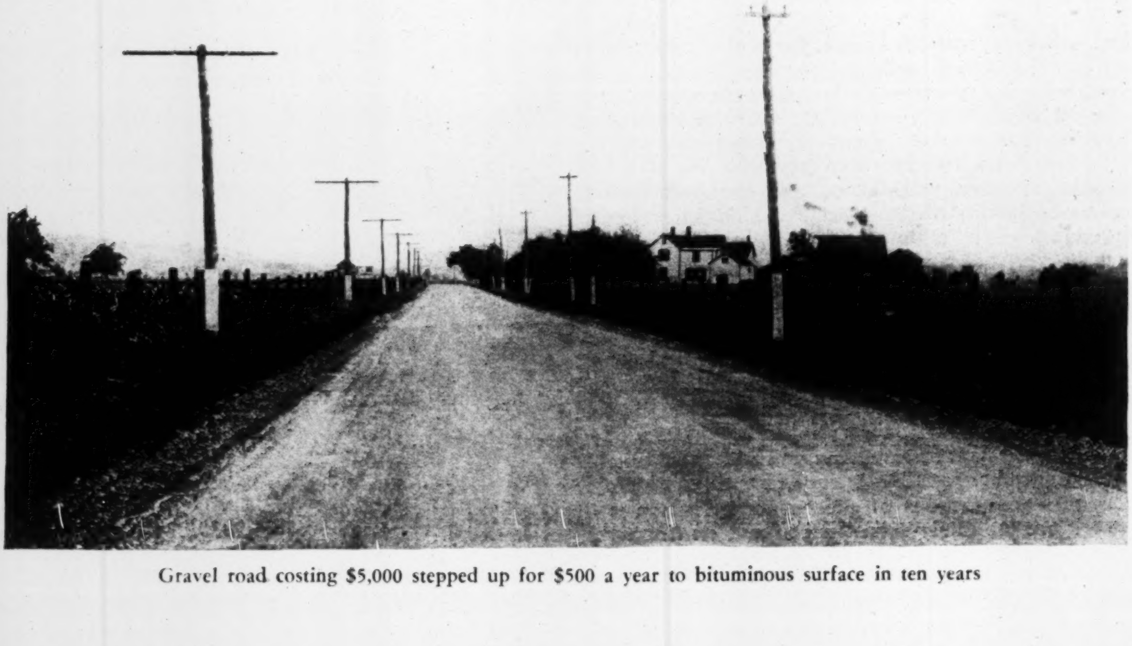
Mixing cover and bituminous material in treatment of old bituminous road

Untreated Surfaces

Among the more important untreated surfaces are the top-soil, sand-clay, sand-gravel, marl, crushed-rock and slag types.

The top-soil roads are built most extensively in South Atlantic states, where the material is found as a natural mixture of sand, including some coarser mineral particles and clay, in surface deposits, and is generally stripped from fields adjoining the road work. For all practical purposes it may be considered as a natural sand-clay possessing characteristics satisfactory for use without modification.

In the case of the sand-clay type the wearing course consists of a mixture of sand and clay produced by transporting the natural mixture from deposits or by incorporating sand or clay, as the case may require, with the natural soil in the road. A satisfactory mixture has been found to consist of 70 to 85 per cent sand, 5 to 10 per cent clay and 10 to 20 per cent silt. The procedure in construction is to mix thoroughly by blading and disking so as to obtain uniformity in the course, advantage being taken of suitable moisture conditions to aid in

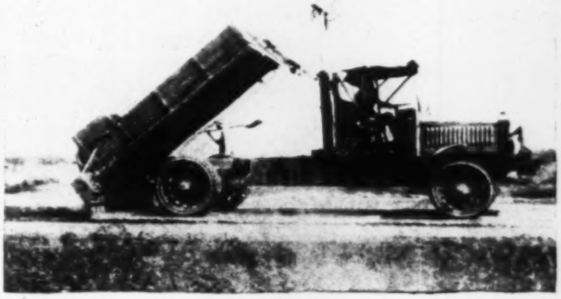


Gravel road costing $5,000 stepped up for $500 a year to bituminous surface in ten years securing compactness and bonding of the materials. Both types of roads are generally built with a thickness of 6 to 9 in. They are greatly superior to the average graded earth road; but, unless treated, they become dusty in dry weather and soften during prolonged wet spells. Both types of roads lend themselves satisfactorily to bituminous-surface treatment, which is a favorite method for improving them.

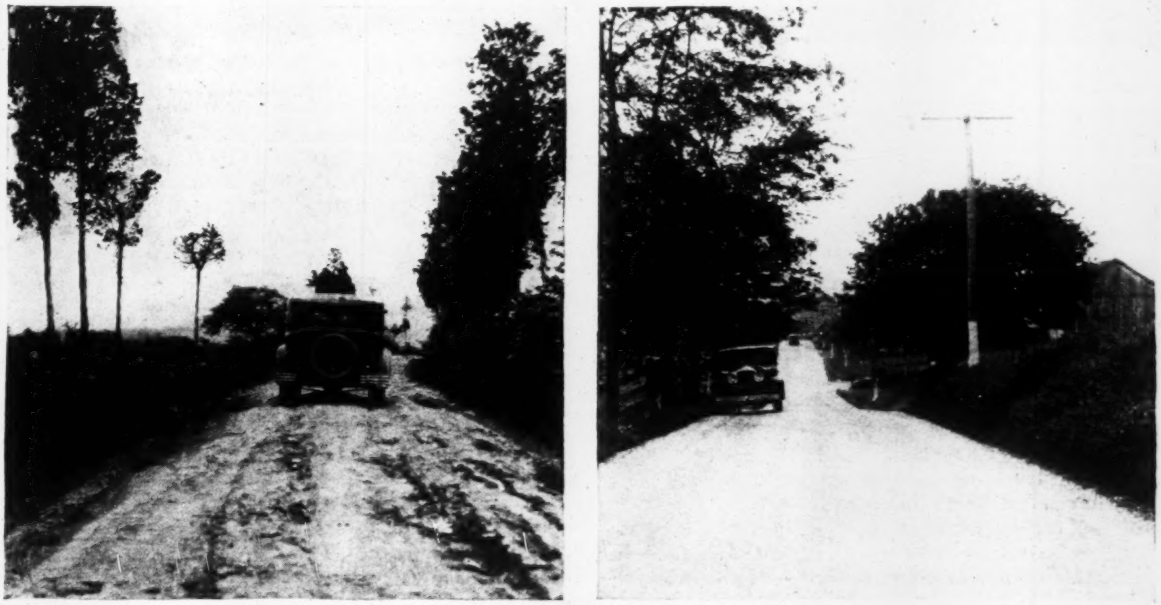
Other types of untreated roads, and probably the most widely used, are the gravel, crushed-stone, blast-furnace slag and others, less widely used, such as marl and chert roads. Roads of these types are built to serve the traffic untreated, or to be given some one of the many types of wearing surface. The granular material may be either a pit-run material containing fines and binder, or it may be crusher-run material to which fines and binder may or may not be added. There is a wide range in sizes used, depending on the supply and as to whether or not a wearing surface is to be added later. The proportion of fines and binder, when used, varies widely, but it should be such as to give the maximum stability to the material. The binder, particularly if it is clay, should be used sparingly and only as required to assure a sufficiently bonded surface. This is very important, particularly if the road is later to be given a bituminous wearing surface. Numerous failures of bituminous wearing surfaces have resulted when built on clay-bonded granular roads containing excess clay binder. Binders other than clay, such as iron oxide and limestone materials, are often available and should be used generally in preference to clay. The average well-graded aggregate, containing from 5 to 12 per cent of granular material passing the 200-mesh sieve, will generally provide a satisfactory stable surface under traffic, except for the very dry regions. Built in this manner, they provide the best condition for bituminous-surface treatments, which is important, as a large percentage of these roads are finally surface-treated.

Another material that has been used considerably, although somewhat locally, is marl or lime rock. This material, when taken from the pit, is grayish-white in color, generally contains considerable moisture and in this condition, can be easily broken down and worked on the road with drags and blade machines. It compacts readily and hardens as it dries. It does not ravel or pothole under traffic but does, however, wear away quickly. Ordinary rains do not affect it, but continued moisture on the surface causes it to soften and rut under traffic. Softening and failure also results when built on low grades where the subsoil is of the type permitting the rise of capillary moisture. This material should, therefore, not be used, except where moisture conditions are favorable, and a road of this type, except where there is very light traffic, should be provided with a wearing surface. It is highly adaptable as a base for bituminous-surface treatment and, for such construction, is being used extensively and satisfactorily where moisture conditions are suitable.

The composition of this material varies considerably in different deposits with a corresponding difference in the resistance to the action of moisture. For the best results the material should contain a high per cent of carbonate of calcium and magnesium and a minimum amount of organic matter.



Spreader boxes extensively used on trucks for surface-treatment operations



Stepping up a poor earth road to an all-year surface of 5 in. of oiled macadam

Road-Mix Mulch-Gravel for Low-Cost County Roads

Forty miles of 18-ft. roads utilizing old gravel built for $1,852 a mile in Allegan County, Mich.

By **GLEN B. COOK**
County Engineer, Allegan County, Mich.

THREE YEARS AGO the Allegan County road commission was forced to face the problem of ever-increasing traffic demands on the county's gravel roads. Each year we were losing from 1 to 2 in. of gravel from the surface, and replacing this material was greatly increasing maintenance costs. In addition, there was a demand for smooth-riding dustless roads.

To meet these demands with temporary dust palliatives and continuous maintenance patrol over its entire system was considered uneconomical, so the commission decided to experiment by hard-surfacing 2 miles of gravel roads with a special grade of refined coal tar. One mile was covered with a 2-in. mixed-in-place type of construction, using 25 to 35 specific viscosity binder and 90 per cent crushed gravel, $\frac{3}{4}$ to $1\frac{1}{4}$ in. in size, at a cost of $3,700 per mile. The other mile was treated by the regular drag-surface-treatment method, using an 8 to 13 specific viscosity binder and pea gravel, at a cost of approximately $1,600 per mile.

The following year it was decided from the result of this experiment that about 12 miles more would be hard-surfaced, using the drag-surface-treatment method because of its lower cost; the only difference was that crushed limestone was used instead of pea gravel because of its uniformity in size and quality. The cost was decreased from $1,600 to $1,500 per mile, due to the larger mileage involved. After one season's service $65 was spent for patching on the entire 14 miles of black top we then had. This amount included materials, labor and truck rental.

This year a 40-mile program was begun April 27. The type of construction varied from the previous year in that instead of sweeping the gravel road clean of all loose gravel and wasting it, as is done in the drag-surface-treatment method, we decided to utilize this material, which amounted to approximately 200 cu.yd. of crushed gravel per mile.

The first operation consisted of shaping the road by means of a rubber-tired one-man power grader, starting at the center and cross-grading out toward the shoulders. This operation was done to eliminate chatter bumps, reduce excessive crown and give a smooth-riding surface. At times the gravel roads were so hard and dry that water was applied with our distributor to shape them properly. We then started at the shoulders and brought all loose material to the center in a windrow, after which a power grader was used to distribute the loose aggregate uniformly to a width of 14 ft. A cover of $\frac{5}{8}$-in. washed crushed limestone was then spread uniformly over this loose gravel at the rate of 200 tons per mile, increasing the loose depth of aggregate to $1\frac{1}{2}$ in.

We then applied 18 to 25 specific viscosity binder at the rate of 4/10 gal. per square yard over the entire width of loose gravel. A power grader was used to clean one half of the road by blading the loose material to a point past the center. The exposed solid surface was then primed with $\frac{1}{4}$ gal. per square yard of 18 to 25 specific viscosity binder. After allowing one hour for the binder to penetrate into the gravel surface, the loose aggregate was bladed over the prime coat in a windrow about 3 ft. past the center of the road, and the other half of the exposed gravel surface was primed with the same quantity of material. The windrow was then bladed to the center of the road, and mixing commenced with a multiple-blade maintainer. After making three complete rounds of mixing, the coated material was spread about 14 ft. in width, and another application was made of the same grade of binder, at the rate of .15 gal. per square yard. Another round of mixing placed the coated material within about 1 ft. of the finished width of the road. A single-blade grader, with a long wheelbase, was used to spread the coated material to the full width of the road (18 ft.) and give it the proper crown. A 10-ton tandem roller was then used to compact this material, and traffic was allowed on the wearing course.

Blading windrow of treated gravel to center of road preparatory to mixing

Spreading cover on seal coat by backing truck

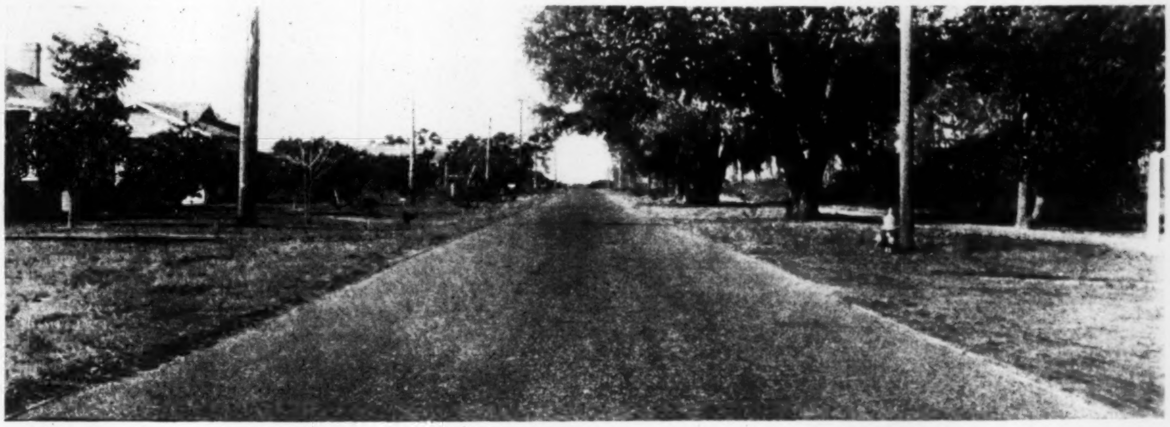
After several days, and in some cases after two weeks, the wearing course was sealed with an application of hot binder, at the rate of $\frac{1}{3}$ gal. per square yard. This was followed by placing $\frac{1}{2}$-in. washed crushed limestone chips on top, at the rate of 100 tons per mile, and rolling same into the binder. The chips were spread from the tailgate of 3-ton dump trucks backing over the treatment.

The average cost per mile for this type of construction, based on 40 miles of 18-ft. width and $1\frac{1}{2}$-in. depth, is $1,852.29, exclusive only of equipment rental. The equipment used consisted of one 800-gal. motor-driven pressure distributor, one 10-ton tandem roller, one multiple-blade maintainer, one power grader, one truck scraper and four gravel trucks. Our average haul on material was about 4 miles, and we have averaged 1 mile complete in one and one-half days.

Construction and Maintenance of Low-Cost Roads

Engineering skill and technique can produce smooth and stable all-year road surfaces at costs generally less than $5,000 a mile

By BERNARD E. GRAY
Highway Engineer, Asphalt Institute, New York City



Florida lime-rock road surface treated and cover-coated with slag

LOW-COST ROADS are those in which inexpensive local materials are utilized for surfacing and are so constructed and maintained that, with any subsequent increase of traffic, they may be improved further by placing additional material or by giving bituminous treatments in such a way as to utilize all previous investment. A low-cost road does not mean a narrow road or half a road, but a full-width two-track surface where complete freedom and safety may be maintained. The cost of such surfaces in no case will exceed $10,000 per mile for a width of 20 ft., and in the great majority of cases will be much less than $5,000 per mile.

Low-cost surfaces are not limited in their usefulness to the so-called secondary roads, but are adapted to any part of the highway system, whether on the main trunk lines or on the side roads, wherever traffic is of moderate amount. Therefore, before discussing the various types themselves it is recommended that the roadbuilder take a proper attitude on this whole matter of selection of surface and discard the notion that only one or two orthodox types will provide a satisfactory service to traffic in any and all situations. All that is required of a road surface is stability, enduring smoothness and adequate width, with all-year continuity of such characteristics. If a road surface made of green cheese would give such conditions for traffic, it would be just as good as any other type. If an earth surface, under favorable local conditions, will adequately take care of traffic, then it is a sheer waste of public funds to build anything else. When, later, traffic increases and exceeds the capacity of this earth road and bituminous treatment or a thin layer of gravel, or a combination of the two, will furnish the additional stability required, then expenditure for a high-type pavement is still entirely unwarranted. In other words, the roadbuilder's attitude should be: How can *all roads* be improved best with materials at hand, at reasonable cost, and still take care of traffic? and not: How can additional taxes be levied to defray costs of a few more miles of expensive types?

Ten years ago it was difficult to motor in comfort for any great distance, but even then the close observer was impressed with the fair condition in summer of much of the main-road mileage and perceived that travel was made difficult largely because of the occasional mud hole. Such roads were often impassable, but if these few short sections had been properly reconstructed, many roads would have been serviceable the year round long before such a happy condition did occur. The writer recalls one particular section of road, approximately 150 ft. in length, where every spring for ten years a dozen men worked for a period pounding up rocks. For some weeks after the "repair," traffic through the mud hole was a fearful and damaging adventure. During these ten years more than $2,000 was expended on this piece of road, and at the end of the period no improvement of any kind was discernible. The road was then taken over for maintenance by the state, and the first thing that was done was to install a corrugated-iron pipe culvert, dig an outlet ditch and make a small fill to raise the grade above the groundwater level. The total expenditure was under $200, but the mud hole had disappeared for all time. This instance is but one in thousands; and yet in many cases, because of one or two mud holes to the mile, vast sums have been expended prematurely and in some cases unnecessarily, when an intelligent analysis of the situation would have led to an equally satisfactory but much less costly improvement.

Natural Earth Surfaces

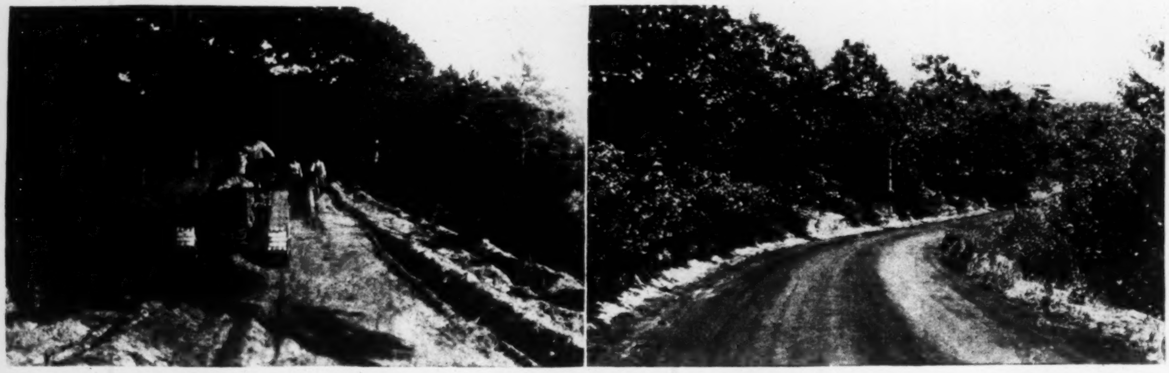
The first essential in the improvement of any road is to provide *an adequate system of drainage.* On state and federal work the grading and draining of a project properly involves revision of alignment and grade and a thorough study of drainage needs. For many township and county roads such expenditures are not possible, but there is absolutely no reason why, over a period of time, the same high degree of drainage may not be obtained. It is not necessary that a roadway be absolutely straight or with perfect grades to insure good drainage. *It is necessary* that it have adequate width, side ditches of sufficient depth and enough cross-culverts.

One of the important developments in roadbuilding equipment has been the perfection of the motor grader, either the one-man type or the combination tractor-drawn machine. Cheap power and heavy equipment make it possible for one or two men operating such an outfit practically to rebuild any road. The first low-cost road is, of course, a plain earth road made from the natural material. In taking over such a road for improvement, the tractor-grader will play an important part, as a good operator can do much of the work by machine. The first step is to clear the right-of-way, so that the sun can get in and dry out the surface. The second step is to get adequate width, and many times this can be accomplished by operating the tractor-grader so as to cut into the edge of the road and work the material to the center or ahead to the low places. Culverts should be installed at frequent intervals and ditches well established. There may not be sufficient money to build all of the culverts in one year, but the worst places should be improved first, in the meantime maintaining depressions in the road to carry the water across. In others words, a plan of procedure, whether it is accomplished all in one year or over several years, is the first essential. The basic theory of low-cost road construction is the possibility for stage construction, everything that is done in any one year being a step toward the finished structure.

Illinois prairie-soil road surface treated with oil

While the grader operations are under way, considerable stability can be worked into the road by utilizing the good material that is moved. Too many times the excavation is jumbled together—good top-soil material, soft vegetable strata, bad clay material, dumped hit or miss—and then for several years thereafter the roadbuilder endeavors to correct the bad subgrade conditions that he actually built into the road at the time of construction. Earth roads can be made to carry up to 100 vehicles a day or more, and where traffic does not exceed this figure additional expenditure for surfacing is rarely justified.

As traffic grows to 300 vehicles per day, the actual loss of earth surfacing, as well as inconvenience to traffic, justifies the placing of a more stable material for a wearing course. There is a wide variety of such materials: top soil, sand-clay, chert, shale, cinders, gravel, crushed stone, etc. There are two principal methods of placing such surfacing,—the trench method and the feather-edge method. The latter method is cheaper, and where no difficulties are encountered by raising the grade it is a method to be preferred. Where culverts are short or where the raising of the grade affects adjacent property, the trench method is better. One advantage of the feather-edge method lies in the ease with which additional material may be added, and the consequent feasibility of starting with somewhat lesser depths than would be practicable in the trench method. It is astonishing how frequently a thin layer of granular material worked into the surface of an earth road produces a high stability under medium traffic. Maintenance of such surfaces is best accomplished by mulching, viz., by blading about 1 in. of loose material over the surface as needed to fill depressions and maintain smoothness.



Massachusetts earth road before and after bituminous-surface treatment

As traffic exceeds 300 vehicles per day, it becomes economical to provide some sort of a bituminous treatment. The loss of the surfacing alone is at a rate where replacement exceeds the cost of the bituminous treatment.

to say nothing of the greater convenience afforded to traffic. There are four principal types of low-cost bituminous treatments: (1) treatment of the natural earth; (2) treatments over prepared surfaces; (3) road-mix surfaces; and (4) plant-mix surfaces.

Bituminous Treatment of Natural Earth

The original purpose of treating an earth road was to lay the dust, and little thought was given either to the preparation of the roadbed or to the possibilities of building up a smooth and enduring surface that would carry considerable traffic under all weather conditions. The results of the early treatments were so good in many instances that study was directed to the reason for such excellence, with the result that a long series of soil studies have brought out information that makes it possible to build many miles of natural bituminous earth surfaces that have given great satisfaction. In the treatment of an earth surface, as in any other bituminous treatment, there are two essentials: (1) drainage and (2) uniformity of surface.

The matter of drainage cannot be overemphasized. Last year the writer was called upon to inspect a road in the South and advise as to the reason for failure of the surface. The first casual inspection showed water standing in the ditches less than 6 in. below the surface of the road. A few dollars a mile expended to open outlet channels completely corrected the trouble in the surface.

By "uniformity" it is meant that every square yard should be of the same quality and character as every other square yard. Pot-holing of a surface occurs almost invariably because of lack of uniformity—coarse material in one place and fine material in another. One area settles a little more than another, and the consequence is that there is an uneven wear and consequent deterioration. Before treatment, therefore, the surface should be scarified and manipulated with a grader, mixing the particles until all areas are alike and a smooth even cross-section is obtained. Sandy soils with a small admixture of loam give the best results, but all soils are materially improved in their carrying capacity by such treatment. Non-volatile or slow-drying binders are preferred because they do not become hard or set, and the surface may be scarified and manipulated easily when reconditioning becomes necessary. The earth should be slightly moist, but without any free water present.

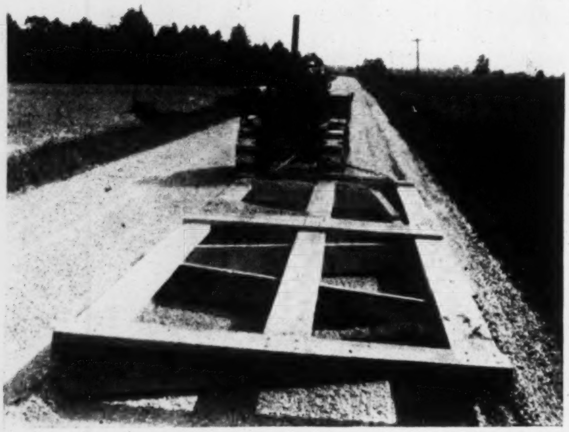
Just before the first application a small amount of earth is bladed to the side of the road, approximately 1 in. of depth usually being enough. The binder is applied at the rate of about $\frac{3}{4}$ gal. per square yard and is covered immediately with the earth that is bladed back from the shoulder. One-man grader outfits or tractor-drawn graders usually are employed, the blading being continued until the surface is smooth and even. The binder gradually absorbs the cover, but if bleeding occurs, additional earth is applied to absorb it. An excess covering of earth should not be used, as it makes a "crumbly" mat. Pneumatic-tired traffic soon irons out the surface, and it is a peculiarity of this type of treatment that traffic consolidation is better than rolling. Narrow iron-tired traffic in excess cuts the road surface, and tractor cleats and lugs are also harmful to it. Suitable bands and protective devices are now available for all tractors, however, and iron-tired traffic is rapidly becoming a thing of the past, even in rural areas. The application of the binder by pressure distributor is to be desired because of uniform application.

As soon as traffic begins to break through this first application, the treated surface should be scarified and pulverized to a depth of 2 or 3 in., regraded, and a second application applied, this being covered with earth and manipulated as before. Usually two applications are sufficient for the first year, and the following winter will find the road surface supporting traffic in good condition with but few bad breaks. During the second year the same procedure should be followed, so that before the second winter sets in an impregnated layer of earth, approximately 4 to 6 in. thick, has been built up. Subsequently, additional applications should be given as conditions require.

Virginia earth road before improvement

Same road after bituminous treatment

Under favorable circumstances surfaces can be built up that resemble pavements, both in appearance and riding qualities. Under the least favorable conditions the period of usefulness for the highway is greatly extended, with only a few weeks at the most during the spring and winter when inconvenience may be encountered. Costs of the treatments will vary from $250 to $500 per mile for an 18-ft. width for the first year, but by the third year they will have dropped to amounts ranging from $50 to $100 per mile as the surface becomes stabilized. While there is definite cumulative value to the treatments, the cost should be considered entirely as one of current maintenance.



Conditioning a gravel road before bituminous treatment

In California, on surfaces of this kind, traffic runs as high as 1,500 vehicles per day; in Illinois 200 to 800 vehicles; and in New England and Long Island from 300 to 2,000 vehicles. In general, however, such treatments would be suitable for traffic ranging from 200 to 600 vehicles per day. Frequently, when traffic exceeds this latter figure, sufficient additional stability of surface may be obtained by working in 2 or 3 in. of granular material in connection with the oiling. Such material, however, should be thoroughly mixed with the earth itself and not placed as a layer. When placed as a layer a hard crust is formed, which soon breaks through and pot-holes, thus making a difficult maintenance condition. Whenever a small break occurs in an earth road the method of repair is to apply a small amount of binder and cover with earth. When the entire surface commences to show breakdown an entirely new retreatment is in order and is carried on in exactly the same manner as the second application referred to above.

A most successful example of the surface treatment of earth roads is to be found in Minnesota, although the method used there would be applicable anywhere under the same conditions and has been adopted by adjoining states having the same character of earth. Certain finely divided clays, of which Minnesota gumbo is one, have a very high bearing power under conditions of optimum moisture content. Furthermore, they have low capillarity and small volume change when frozen, so that when such roadbeds are properly graded above the groundwater level they make excellent surfaces during the dry weather, except, of course, for dust. With the rainy weather, however, there is a gradual mixing of the clay with the water from the surface downward, until a veritable quagmire results. On such gumbo surface the application of gravel alone gives but temporary relief, as the gumbo "eats" the gravel during this plastic condition and the latter soon disappears. By treating the surface and thus preventing the surface water from becoming mixed with the clay, this summer-time stability may be maintained the year round. Experiments were begun in 1925, and today on many miles of well-graded natural gumbo surfaces, treated with road oil and thin gravel cover, excellent year-round surfaces have been built up at costs of around $1,700 per mile. Annual maintenance costs, including retreatments and additional gravel, run from $500 to $700 per mile. While all such expenditures are charged to current maintenance, there is a definite degree of cumulative surface betterment each year.

Surface Treatment of Selected Materials

It is hard to draw an exact line between surface treatments and road mixes, but where a bituminous mat is built up less than 1 in. thick, it generally is considered to be a surface treatment; and where greater depths are constructed, it is grouped with the road mixes.

In surface-treatment operations there are several important steps; and as reference will be made to them frequently, certain definitions are given herewith in order to avoid repetition.

Road-mixing bituminous surface with spring-tooth harrow

Sweeping—The item of sweeping is most important. The vulnerable part of any surface treatment is the outer edge, and failures usually occur not because of poor design but rather because of poor execution. Where loose material is not completely swept from the area to be treated, a soft spongy place is developed under this outer edge, which permits the infiltration of water between the bituminous mat and the underlying roadbed. It is, therefore, good practice to sweep thoroughly for a width of 21 ft. when a surface treatment width of 20 ft. is planned. An inspection of surface treatment jobs taken at random will show that in many instances careful sweeping was not done. The sweeper, to avoid the guard rail or culvert headwalls, did not sweep to the outer edge of the roadway. The distributor then applied asphalt over the dust, chips were cast over the asphalt and the roller apparently compacted the surface, so that it looked well covered. With the first wet weather the edge commenced to break down, and this breaking-down then became progressive toward the center. The edges of the road should be hand-broomed, in addition to the power-sweeping, so as to insure this thorough cleaning and to provide a margin of at least 6 in. of swept area beyond the treated portion.

Rolling—The specifications for rolling usually call for a three-wheel roller weighing not less than 10 tons. This does not adequately define the character of compression desired, and it is better described as pressure per linear-inch width of roll. For all rolling, as provided herein, there is meant a three-wheel roller having a compression of not less than 350 lb. per linear-inch of width of roll.

Chips or Cover Coat—By cover coat of chips is meant a crushed aggregate consisting of fragments of stone, gravel or slag, ranging in size from $\frac{1}{4}$ in. to $1\frac{1}{4}$ in. This material is known commercially as "$\frac{3}{4}$-in. chips," because most of the fragments are of about this dimension. Such chips should be manufactured from a clean hard aggregate and should contain not more than 5 per cent of dust. Round gravel may be used for the cover coat, at least in the treatment of loose gravel surfaces, but for all other situations the crushed aggregate will produce superior results.

The treatment of selected materials falls into two general groups. In one, the materials have high natural stability but do not bond readily, thus requiring frequent manipulation by the grader to maintain a smooth surface. In the other group, the materials have a high degree of cementitiousness, and under the puddling action of the grader and drag may be consolidated into a dense firm surface, almost free from loose particles. Before the first group can be given a satisfactory bituminous surface it is first necessary to consolidate the loose mulch top and to cement the particles together artificially. In the group of loose materials would be included cinders, loose sandy gravels, traffic-bound macadam, granulated slag, etc.

Early in the spring the road is conditioned thoroughly by constant blading and dragging until a true even cross-section and profile are obtained. The loose material is then bladed to the side of the road, and a prime coat is applied at the rate of $\frac{1}{3}$ to $\frac{1}{2}$ gal. per square yard. This material is of low viscosity, with high penetrating qualities, and one that will completely "kill" the dust. Immediately after, a small amount of loose material should be bladed back over the surface and dragged with a broom drag to insure complete coating and to fill up the rythmic corrugations and depressions that usually are found in untreated surfaces of this kind. After this priming operation traffic should be permitted to use the road for several days to several weeks, during which time all weak places develop and proper repairs should be made. All loose and unbound particles whip to the edge, and the surface then shows itself to be well bonded and ready for the seal coat. This is applied at the rate of from $\frac{1}{4}$ to $\frac{1}{3}$ gal. per square yard and immediately covered with from 25 to 35 lb. of chips. The surface then should be thoroughly dragged with a broom drag to coat all particles and to finish the filling of the corrugations completely. Such breaks as may occur in the surface are repaired by removing all loose materials and filling the depressions with an asphalt-gravel mixture, utilizing the same materials as in the case of the original construction. The second year a retreatment is given at the rate of $\frac{1}{4}$ gal. per square yard, with 25 lb. of chips for cover coat. Repairs to any broken areas should be made before this second treatment. By the end of the second year the surface will have become well stabilized and uniformly covered. Subsequent treatments will be required at intervals from two to three years, according to conditions, but the quality of the surface will show continuous improvement and the repairs will become constantly fewer.

The cementitious group includes sand-clay, chert, shale, limerock, clay gravels, etc., and is readily bonded under traffic in an untreated condition during the spring months of the year. For the original treatment the same requirement of careful blading and grading, to insure uniformity of surface, is a prerequisite. The surface is first swept with a rotary broom and push brooms to clean the surface entirely. The surface then should be primed with a low-viscosity binder at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ gal. per square yard, the amount varying according to the absorptive character of the surface. This prime coat should be allowed to become absorbed into the surface *without any cover coat*. Not less than 24 hours later a second application is made. It is applied at the rate of $\frac{1}{10}$ gal. to the square yard and covered with approximately 50 lb. of chips. This cover coat is then broomed smooth and even and is thoroughly rolled.

Maintenance consists of necessary patching during the first year and subsequent retreatments as traffic conditions may require. The cost of original treatments varies from $800 to $1,500 per mile, with annual maintenance thereafter averaging from $300 to $600, according to traffic and the character of the original surface. Very notable instances of high-type surfaces of this character are found in the South, especially surface-treated limerock, as found in Florida, Georgia and other states. Costs of maintenance on surface-treated limerock the fourth year after original treatment were less than $25 per mile, and yet the road surface resembled the highest type of bituminous pavement. Such surfaces are a reflection of intelligent examination of the possibilities of utilizing low-cost local materials in accordance with climatic conditions.

Road-Mix Types

Road-mix types are of recent development and may be grouped in two general classes: (1) the graded aggregate type and (2) the macadam aggregate type.

In the graded aggregate type the material consists of a continuously graded gravel or crusher-run stone, ranging from about 1 in. in diameter down to and including dust. In the other the aggregate is a one-size crushed product such as stone slag or washed gravel, from $1\frac{1}{2}$ to $\frac{1}{4}$ in. in diameter and free from dust. The graded aggregate type was first developed in the West and is known under a variety of names, such as oil-processed roads, mixed-in-place gravel, etc. All road-mix surfaces, when they are properly built, have three outstanding and advantageous characteristics: low cost, rapid construction and smoothness.

Slightly different methods of construction are required for the two types. As in all other work, preparation of the surface before treatment is all important. Adequate drainage should be provided, and all soft places and pot-holes in the existing road grade should be properly repaired. There is no impression, in connection with any type of road surfacing, that is more erroneous than the belief that merely smoothing the top of the wearing course will produce smooth riding. If the subgrade is first made smooth and uniform, little trouble will occur later with the top.

While the graded aggregate type may be constructed from crusher-stone, it is usually built from fine sandy gravel. If the existing gravel surface is sufficiently thick and stable, all the aggregate for the road-mix top may be obtained by scarifying. New material may be added, if necessary, to the full depth of the road-mix coarse, or any combination of new material, plus light scarifying. Whenever new material is added, it should be placed several weeks before mixing operations are started, so that the surface may be carefully conditioned and bladed to obtain a uniform and even distribution of the gravel. Fine material in proper proportions vastly increases the stability of the surface. After such preparation and testing of the road metal the surface should be scarified to a depth of approximately $2\frac{1}{2}$ in. and thoroughly pulverized with a disk harrow. The first application is at the rate of $\frac{1}{2}$ gal. to the square yard, and the surface is harrowed immediately to obtain partial mixing and also to prevent picking up by traffic. In the same manner additional applications are applied in increments of $\frac{1}{2}$ gal. or less, until the total required amount has been given, after which the mixture is bladed to a window in the center, care being taken not to include any untreated aggregate. Further mixing is carried on by the user of tractor-grader outfits, the material being bladed back and forth over the road until a thoroughly complete mixing has been obtained, after which the road mixture is again windrowed in the center.

At this point an important construction detail will require attention. As in all surface treatments, the point of weakness is the edge of the road because of the infiltration of water between the surface and the underlying subgrade. This can be prevented largely by providing a thickened edge. This is accomplished by cutting a V-shaped trench at the outer edge, 2 to 3 in. deep at the outside and tapering inward for a distance of 2 or 3 ft. The material taken from the trench is thrown over the shoulder and serves as a lateral support to the road-mix surface. The road mixture in the center is then bladed over the surface by successive passes of the grader, thus building up the surface depth by thin layers, so that good compaction is obtained under the tractor wheels and traffic. Furthermore, by spreading from a center windrow, such compaction will be distributed evenly from the edge to the center. After all the material is distributed, blading and dragging should be continued until a smooth and even surface is obtained.

One great advantage of the graded aggregate type is the ability afforded to rework the surface as is necessary, even after a year or more. While a firm crust is very quickly developed under traffic, light scarifying will make it possible to reblade the surface and correct any depressions that may develop during the first few months. Should the surface show a little leanness, an additional light application may be made; and should there be a surplus of binder, a light additional cover of gravel may be spread, after which further mixing and blading may be carried on until a uniformly smooth surface of the proper stability is obtained.

After several weeks under traffic a seal coat of approximately $\frac{1}{8}$ gal. per square yard is applied, covered with about 8 lb. of sand or stone screenings, followed by thorough mixing and spreading obtained by means of a broom drag. This seal coat should be applied well along before the winter, so that traffic will iron it out. A supply of mixed material should be stored for patching use.

The *macadam aggregate type* may placed on any sound roadbed as a base, i cluding macadam, cementitious grav chert, shale, sand-clay, etc. It is an exce lent method for improving a surface where growi traffic requires increased stability and wearing qualiti and it fits into a scheme of stage construction to exce lent advantage. When placed on surfaces that were n previously treated, a priming operation is required, usi approximately $\frac{1}{3}$ gal. per square yard without cove This primer penetrates the surface and "kills" the dus waterproofing the surface and preventing any loose ma terial from working up into the road mix itself. Th aggregate is spread evenly to a depth of $2\frac{1}{2}$ in. loose, an binder is then applied at the rate of $\frac{1}{2}$ gal. per square yar and mixed with the aggregate by using both the harro and the grader. There are also a number of multipl blade devices that accomplish this mixing in a rapi manner, but it can be done well with an ordinary blad grader and a disk harrow, or a spring-tooth harrow and a drag. When the stone and asphalt have been mixed thoroughly, the material is spread out smooth and even and a second application is given at the rate of $\frac{1}{3}$ to $\frac{1}{2}$ gal per square yard, followed by harrowing and blading until the stone is thoroughly coated. This mixing continue until the asphalt becomes tacky and begins to set up, whereupon the mixture is bladed out to a true and even contour, dragged and thoroughly rolled. Dragging and rolling should continue for several days until no further movement is discernible under the roller. Several weeks later—in any event, before the following winter—a seal coat should be applied. Crushed aggregate ($\frac{1}{4}$x$\frac{3}{4}$ in.) is spread over the surface at the rate of 35 lb. per square yard, after which an application of binder is given at the rate of $\frac{1}{3}$ gal. per square yard. The aggregate and binder are thoroughly dragged to insure complete mixing, as well as to correct any irregularities in the surface. This dragging should continue until the binder becomes "tacky," after which the surface should be thoroughly rolled.

During the first winter a certain amount of raveling will occur, and an occasional pot-hole will develop. These repairs are to be expected and should be met by installing proper under-drainage, removing all loose material and then filling in the depressions with pre-mixed aggregate and binder of the same kind used in the original construction. As it is always better to use too little bituminous material than too much, a light surface treatment may be found necessary during the second season, this treatment consisting of $\frac{1}{8}$ to $\frac{1}{4}$ gal. to the square yard of asphalt, covered with 10 to 20 lb. of chips. Thereafter, retreatments will be given every two or three years as traffic and weather conditions may require. Costs of this type of surface vary from 25 to 60c. per square yard for the 2-in. compacted thickness, with the average for the past year in the neighborhood of 40c. per square yard. For a 20-ft. roadway this is about $5,000 per mile. Annual maintenance costs will be less than $500 per mile for such widths and will tend to become less as the years go by.

Plant Mixes (Cold)

Both of the foregoing types of road mix are well adapted to plant mix, and in many cases this method of mixing is decidedly advantageous. With cold mixtures a standard asphalt plant is not required, and there are a number of mixing-equipment machines on the market that do such work rapidly and efficiently. Several advantages of the plant mix are the control of the size and character of the aggregate, the use of a higher viscosity asphalt and the elimination of inconvenience to traffic by the road-mixing operations. Furthermore, in the graded aggregate type, where slow-drying binders are employed, a large tonnage of the mixture may be made up in advance, so that, when favorable weather conditions obtain, the volume of the mixture is of sufficient amount to permit very rapid construction.

There are also several excellent machines already developed that pick up the aggregate from the roadbed, accurately proportion and mix it with the bitumen, deposit the finished mixture behind the machine and then, by a finishing machine, spread, smooth and compact the surface. One machine, recently demonstrated, produced such a mixture at the rate of 48 cu.ft. per minute, which is at the rate of approximately 10 lin.-ft. of roadbed, 20 ft. wide, completed per minute. Unquestionably, these methods of plant mix, both on the road and at some central point, will continue to develop at a very rapid rate, as the merit of these surfaces is better appreciated.

Contract Construction Practicable

It has been thought by some engineers that low-cost surfaces were not adapted to contracting. Decidedly the contrary is true. With surface treatments it is frequently desirable to handle the preparation of the roadbed by public forces because of the length of time during such preparation; but wherever operations may be carried on within a relatively short space of time, such as the application of the bituminous materials and the spreading of the cover coat, then it is believed that such work can be most profitably done under contract. With the road-mix and plant-mix operations, such work can be let to contract in its entirety. Furthermore, contractors becoming skilled in this kind of work will effect very marked economies even over present methods, with still further reduction in cost, and yet with a satisfactory profit margin to the contractor himself. The necessary investment for equipment is proportionately low for this type of low-cost work, and such equipment may be mobilized easily to permit the doubling or tripling, or more, of the rate of daily output, a decided advantage on contract operations.

Conclusions

1. By exercising proper engineering skill and technique these surfaces may be made to fit conditions of light and medium traffic at very low costs.

2. Every proper engineering principle of design, such as adequate drainage, careful grading and inspection, should be applied in the construction of these low-cost surfaces, with a view not only to the immediate success but with the definite plan that, as traffic develops, all previous work shall serve as a foundation for additional improvement.

3. It is not possible to build any kind of a surface, whether high- or low-cost that will not require maintenance. There is a difference, however, in the character of maintenance of low-cost surfaces as compared with those of high type, in that with the latter the maintenance work does not appear for the first two or three years, while in the low-cost surfaces the principal maintenance occurs during the first one or two years, after which it steadily declines and the quality of the surface continually improves. The engineer, therefore, should be prepared to do this maintenance and to answer any criticism of the public to the effect that the road is going to pieces, when, as a matter of fact, those sections that need further correction are showing themselves. When such repair is made, little further difficulty is encountered.

4. Too many communities have built costly monuments to pride on a very small mileage, when a common-sense attitude on road values will give them from three to ten times more useful mileage for the same expenditure.

5. There is no state, county, township or city where one or more of these low-cost surfaces will not provide adequate traffic service on a very substantial proportion of the highways within its boundaries.

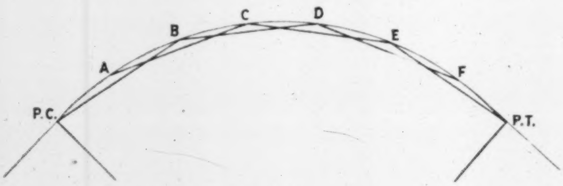
Oil-processed graded-aggregate Wyoming road surface mixed in place

Engineering Procedure in Local Road Improvement

Must correspond with low order of work—Disproportionate refinement and cost is grave danger

By P. M. TEBBS
Assistant Chief Engineer, State Department of Highways, Harrisburg, Pa.

BY A RECENT ACT of the Legislature more than 20,000 miles of rural roads were added to the state highway system of Pensylvania as of Aug. 15, 1931, increasing the mileage to about 34,000 on the state highway system. The highway department had been organized for relatively high-type construction and the more expensive class of improved highway. All of the main highways comprising the primary system have been improved, and the momentum of the organization for high-type construction might have carried us into our program of rural road construction with too great engineering refinement and cost. It has been necessary to reorganize, therefore, in order to get down to simple fundamentals, with necessary economies in engineering and construction, to carry out these new responsibilities successfully



Method of random location of highway curves

In anticipation of the addition of these rural roads to the system, we analyzed the entire situation and, after a complete study of all factors, adopted a tentative procedure. A program of about 820 miles of light-traffic highways on the old system was authorized for construction at a cost of approximately $6,000 per mile. This construction was distributed over the state in such a way that every section would receive its share and all of the organization would obtain the necessary experience with this class of work.

The tentative procedure being agreed upon, the division engineers were ordered to the field to undertake the accomplishment of this program. In this class of work it is essential that the project engineer be of the resourceful practical type rather than the more technical type. The project engineer first made a thorough study of the local conditions and materials, and thereafter a representative of the materials laboratory investigated the materials that were proposed to be used. After necessary tests, specifications were prepared for these materials. This preliminary program has been undertaken and completed exclusively by the forces of the department.

The engineering work of the layout of these highways consisted of a chained and referenced center line. The lines, grades and widths were obtained by string lines set by trained foremen as the work progressed. The project engineers inspected the projects frequently, located the drainage and instructed the foremen as to the improvement of alignment and grades. Dangerous conditions were corrected, all curves were superelevated and curves of a smaller radius than 600 ft. were widened.

The results of this class of work were not anticipated by many with any degree of optimism. It remained for the results to sell the idea generally, which is now being acomplished rapidly.

The lateness of the season and the relative lack of experience by our contractors in this class of construction rendered it inexpedient to launch into a large program by contract. Certain contractors, however, indicated their desire to gain experience in this type of work, and after a conference with the engineers of the department these contractors were permitted to inspect several projects in the field, and after a thorough study of the situation advise us whether they would be able to undertake this work at the estimated cost. As a result, five projects were advertised, upon three of which reasonable bids were received. The work is proceeding in a manner satisfactory to this department. In preparing plans and estimates for contract work, the following procedure is followed: The project engineer studies the project and determines what revisions of alignment and grade are necessary. With these data available, he instructs the party chief as to the survey, control points, revisions, etc. A traverse center-line survey is established with offset stakes at even stations and breaks in grade. On curves of over 6 deg. offset stakes are set at 50-ft. intervals, and on curves of more than 16 deg. at 25-ft. intervals. These stakes are located so that they may be used for construction without being disturbed. The beginning and ends of curves and other convenient transit points are referenced positively so that the line may be re-established. Random curves—that is, curves laid out and adjusted by eye—are used in most cases. This is accomplished as shown in the accompanying sketch.

The party chief establishes the P. C., and with an assistant chains the points on the curve, locating them at random. Then standing on P. C. he looks ahead to *B* and estimates the offset distance of *A* from the chord upon which he is sighting. He then stands on *A* and sights to *C* and estimates the offset of *B*. Proceeding ahead on the curve, he recognizes any irregularities in offset distances and adjusts them uniformly. With the transit set on the P. C., angles are read to *A*, *B*, *C*, etc., and the distances chained on the center line of the curve. The last visible point on curve is made a transit point and the long chord chained from the P. C. is the traverse line for re-establishing the survey. Another simple method is to chain and adjust the random curve, read the angle to the farthest visible curve point and divide the deflection angle by the number of curve points ahead, and thus set each intermediate curve point by deflection angle, chaining on the curve from the P. C.

In establishing the alignment particular attention must be given to economies in grading cost, character of materials to be excavated, and as far as practicable provision should be made for locating the pavement surface on firm ground rather than overlapping new fills. Where it is necessary to record topography, such as poles, fences, buildings, trees, etc., the field work should be simplified as much as possible. Since the width and type of road has been determined, only such topography need be recorded as will be affected by the improvement. The topography may be located by pluses on the center line and measured offsets. The angles of connecting roads, driveways, property lines, etc., may be determined by means of a pocket compass.

Type of rural road being improved in Pennsylvania

Completed Pennsylvania country road widened to 22 ft. with 14-ft. oil-bound surface

Surveys for bridges to be reconstructed should follow standard practice. Complete data for culvert pipe should be obtained, including size, length and location. The boundaries of municipal subdivisions should be located by pluses, and the angles determined by pocket compass where practicable. Benchmarks should be established in the standard manner.

Profile-elevation data should be secured for all center-line points and offset stakes by means of a wye level, and the profile plotted in the field, if possible, to facilitate the establishment of a grade line, the proper location for drainage culverts and ditches, and to work out the most economical grading operations.

In general, it is anticipated that the rough grading will be performed with drawn blade graders and tractors. In many cases where the distribution of grading material requires loading, and hauling it may be necessary to obtain cross-sections and develop more detailed plans on these particular sections. These cross-sections may be taken by means of a lock level. The "fine" grading and construction of shoulders to sustain the surfacing material is performed by power graders. The grading on this type of construction is simplified considerably by the reduction of clearing and grubbing to the minimum, the elimination of the spreading and compaction of embankments in relatively thin horizontal layers, and by requiring only the thorough rolling of the finished surface of the graded roadbed. Sloping is limited to that required for stability and reasonable regularity without overhang.

The contract units should be limited to the least practicable number. The grading may be paid for at a contract price per linear foot of roadway of the width, cross-section and approximate line and grade shown on the drawings. This item may also include incidental grading such as ditches, intersections, approach driveways, etc.

A wearing surface of the specified materials, type, width, depth and cross-section may be paid for at a contract unit price per linear foot of completed roadway surface. If there is any variation in the depth or character of pavement surface, it may be shown by separate typical cross-sections. Occasionally it is anticipated that the engineer will vary the depth of the surface course, depending upon local subgrade conditions as revealed

A good cheap base course, giving local employment in placing and knapping stone

after the rough grading is completed; in such case it may be more satisfactory and economical to contract for the completed work on the basis of the tonnage or yardage of material used to complete the wearing surface. If the material is to be paid for on one of these bases, a careful check must be kept upon the material delivered in order that payment may be made for the correct quantities. Culvert pipe may be paid for at the contract unit price per linear foot of pipe, including trenching, backfilling, inlet and outlet ditches. Other structures may be paid for at unit prices in accordance with standard practice.

The drawings may consist of a title page showing the location and description of the project, typical cross-section or cross-sections, general notes, tabulations of ditches, pipe culvert locations (sizes and lengths) and a straight-line diagram of the project. On this diagram the general location of intersecting roads, principal structures, municipal boundaries, railways and other pertinent information may be shown. The second sheet of the drawings may include a tabulation of the cuts and fills from the center-line profile points as determined by the established grade line. It is our practice to permit a tolerance of 6 in. above or below the established grade line, with the understanding that there shall be no sharp breaks in the completed surface. The variations from the established grade line should not be greater than at a rate of 1 per cent, and the grade should not be flattened or reversed so as to result in improper drainage. A minimum grade should be established as 0.5 ft. in 100 ft. Tolerance in alignment of 1 ft. either right or left is permitted, if no abrupt breaks in alignment result.

If any section requires heavy grading and should be paid for upon a cubic-yardage basis a detailed plan for such operations should be included on the drawings and this work separated from the other grading items.

Necessary standards should be attached to drawings.

The proposal should include necessary revisions of specifications to cover the character of work to be performed. Particular attention should be drawn to the local materials meeting the specifications. It is considered advisable to option local materials where they are not abundant, in order that an individual may not secure control of the material supply. The average cost of surveys and the preparation of plans as herein outlined has been about $75 a mile.

Our experience is not sufficiently extensive to indicate definitely to what extent this type of wor may be attractive to contractors, but I se no reason why it should not be, provide a sufficient quantity of work is included i the individual contract.

The work that has been completed so far, involvin the engineering principles outlined above, has proved t be economical and satisfactory, and I believe these general principles are applicable where this type of improvement is to be made.

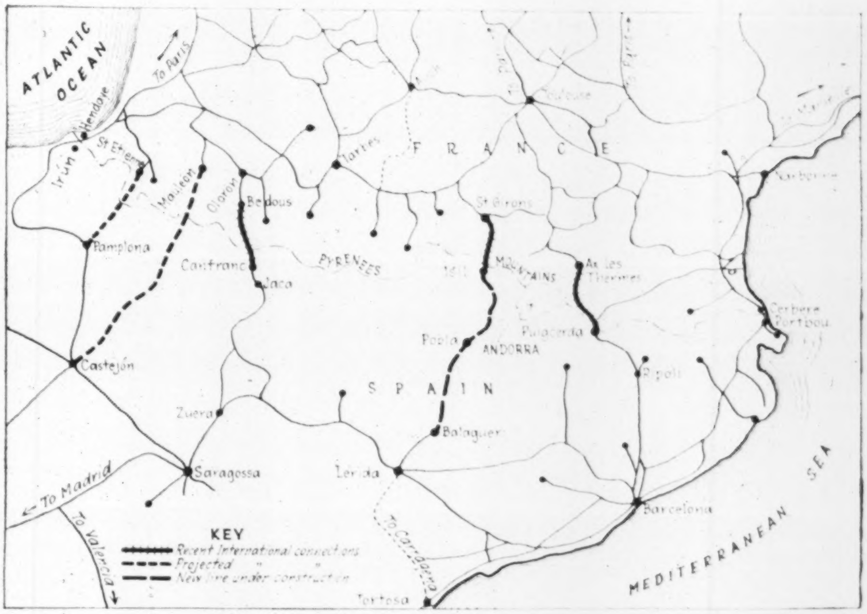
* * *

Pyrenees Mountain Lines Connect French and Spanish Railways

TWO mountain railway tunnels piercing the Pyrenees Mountains within the past three years have opened new lines of communication between France and Spain, although differences in gage of track still prevent through-routing of trains. A third line and tunnel are under construction. Owing to the formidable mountain barrier along the entire length of the frontier, railway connections had been limited to two coast lines. At the Atlantic end a line built in 1864 crosses the frontier between Hendaye and Irún, while at the Mediterranean end another line, built in 1878, crosses between Cerbère and Portbou. These old and new lines, together with two projects that are still in the promotion stage, are shown on the accompanying map.

The railway from Bedous to Jaca, 18 miles, opened in 1928, crosses the frontier at El. 3973 in the Somport tunnel, 25,836 ft. long. Of thirteen other tunnels the longest are a spiral tunnel of 5,742 ft. and the Portalet, which is 3,084 ft. The maximum grades are 4.3 and 3.5 per cent, with 9 deg. curves. This line was followed in 1929 by the railway from Ax-les-Thermes to Puigcerda, 26 miles, crossing the range by the Puymorens tunnel, 15,568 ft. long, in French territory. From its northern terminal at El. 2,297 it rises to the summit at El. 5,250 in the tunnel and then drops to El. 4,035 on the Spanish side. Ten shorter tunnels include a spiral of 5,742 ft. and the Barth Espesse, 4,002 ft. Numerous bridges and viaducts are required on both railways.

Both these lines connect the systems of the Midi—or Southern—Railway, in France, and the Northern Railway of Spain. But as the former is of standard gage, while the latter has the Spanish gage of 5 ft. 6 in., all



Present and proposed trans-Pyrenees railways

passengers and freight have to be transferred at the frontier stations. However, from the frontier station of Puigcerda, on the second line, the Spanish railway will be changed to standard gage as far as Ripoli, 30 miles, beyond which a third rail for mixed gage will be laid to Barcelona, a distance of 66 miles. Thus there will be a through standard-gage route from French points to this important city and port on the Mediterranean. The change of gage has not yet been made, but electrification has been completed between Puigcerda and Ripoli.

A third route is practically completed on the French side, from St. Girons for 25 miles to the Salau tunnel at the frontier. But on the Spanish side a new railway of considerable length is necessary to connect with the existing system at Lérida. This extension is built from Lérida north to Balaguer, 16 miles, and is under construction thence to Pobla de Segur, 40 miles, beyond which it is under survey for 45 miles to the Salau Pass. Two other definite routes that have been studied are from St. Etienne to Pamplona and a long line from Mauleon to Castejón, each route crossing the frontier in a long tunnel. These projects are still in the paper stages.

Hand Labor on Public Construction Basis of Newark Work Relief

NEWARK, the largest city in New Jersey, will carry on, during the next few months, the program of public-works construction started last winter, but on a larger scale. Projects are selected that involve a comparatively large proportion of direct labor, and the use of machines, except motor trucks, is avoided. Small truck owners are favored in hiring the latter. Typical projects include water-main extensions, sewers, grading and paving at the municipal airport, excavation for a new trolley subway and forestry work on the city's watershed. This last results in the production of firewood for free distribution among the poor.

Last winter jobs were given to a total of 2,990 men during the period from Dec. 8 to March 6, and 123 trucks were hired. Most of the work was concentrated in excavation on the trolley subway, which occupied 2,530 men and 115 trucks for a 47-day period. Using hand labor entirely, 136,793 cu.yd. of earth was excavated at a cost of $503,395, of which $347,938, or 69 per cent, was paid out in direct wages. In addition, $10,265 was spent in serving a hot noon-day meal.

This year men seeking assistance register with the overseer of the poor, who also acts as the city director of work relief. Public schools are used as branch offices. Each applicant is investigated, and his degree of need determined by competent investigators, many of whom are volunteers. When necessary, immediate assistance is granted in the form of grocery and milk orders; but, in the case of able-bodied workers, the usual practice is to assign the applicant to a job in accordance with the number of men requisitioned by the city department of public affairs, the part of the municipal government concerned with public works. An attempt is made to fit the job to the man, those not accustomed to manual labor being used, as far as possible, as timekeepers, checkers and in similar posts. The standard wage scale is 50c. per hour, with a possible maximum of $20 per week, although a few skilled workmen receive higher pay, but never exceed 75 per cent of their normal scale nor a maximum of $27 per week. All wage payments are in cash. As a rule, the men work a full week and are then laid off a week. Those with dependents are given priority in assignments.

Work is conducted in cooperation with the state emergency unemployment organization, which grants the city an allowance not to exceed $1 per capita that must be matched by city appropriations. The population of the city is 442,337. It is anticipated that this entire amount will be needed this winter, and there is a strong possibility that additional city appropriations will be found necessary before the cold weather is over.

The work is supervised by regular employees of the department of public affairs. This entails no unusual hardship because the relief work occurs during the slack season on regular construction. Occasionally one of the temporary workers with the necessary qualifications is given a foreman's post. It has been found that many highly skilled workers are included in the applicants for work; on reforestation, for example, one man who has been a lumberjack is acting as a foreman, and two who are normally employed as expert grinders in the manufacture of jewelry are sharpening tools. As a whole, the labor used has been found neither more nor less efficient than during normal times. James W. Costello is chief engineer of the department of public affairs.

Horizontal Shear and Shearing Deflection of Beams

New design data based on recently revised lists of Carnegie and Bethlehem structural shapes, with some figures on built-up girders

By ROBINS FLEMING
American Bridge Co., New York, N. Y.

HORIZONTAL shearing stress is not widely used in structural design, since at any given point it is equal to the vertical shear which is always taken into consideration. However, it is sometimes advantageous to think in terms of horizontal shear in examining the adequacy of flanges—for instance, on uniformly loaded short-span beams and on all beams that carry heavy concentrated loads near the supports. In wood beams of rectangular cross-section failure often occurs by shear along the neutral axis (since the intensity of shear along the neutral surface is 1½ times the mean intensity over the whole area), indicating that horizontal shear rather than bending should determine the dimensions of such beams. For steel beams horizontal shear is particularly important where heavy loads are concentrated near the supports.

Since July 1, 1931, both the U. S. Steel Corp. and the Bethlehem Steel Corp. have been rolling a simplified and standardized list of sections. In order that these sections may be used most efficiently by the structural designer, the accompanying tables are presented. Table I is devoted to rolled shapes, Table II to plate girders. Both tables show at a glance how much greater is the maximum intensity of horizontal shear than the mean intensity of vertical shear. The notation upon which the tables are based is as follows: $S_h = \dfrac{M_s V}{It}$ = intensity of horizontal shear per square inch.

In this formula M_s is the statical moment of the section between neutral axis and extreme fibers, I the moment of inertia of the beam; t the thickness of the web and V the total vertical shear at the section considered.

If a equals the area of the web of the beam (dt) then V/a equals the mean or average unit stress in the web of the beam. Consequently, the excess of maximum horizontal shear over mean vertical shear is

$$\frac{M_s V}{It} \div V/a = \frac{M_s d}{I}.$$

Shearing Deflection of Beams—Another subject not entirely unrelated to horizontal shearing stresses is the shearing deflection of beams. Although shearing deflection can safely be neglected in ordinary design, authorities are agreed that it, as well as bending deflection, should be considered when deflections are extremely limited—for instance, in the design of supports of turbo-generators, where deflections are usually limited

TABLE I—HORIZONTAL AND VERTICAL SHEAR IN CARNEGIE AND BETHLEHEM BEAMS

Section In. Lb.	S_h	V/a	Excess Per Cent
36x16½x240	.0396V	.0351V	12.5
36x12 x158	.0503V	.0438V	15.0
33x15¾x200	.0475V	.0421V	12.8
33x11½x125	.0613V	.0531V	15.3
30x15 x180	.0555V	.0494V	12.2
30x10½x115	.0651V	.0600V	15.3
28x14¾x166	.0596V	.0529V	12.6*
28x10 x 97	.0886V	.0760V	16.6*
27x14 x145	.0716V	.0639V	11.8†
27x10 x 85	.0944V	.0823V	14.8†
26x14 x145	.0739V	.0646V	14.4*
26x 9½x 85	.0994V	.0855V	16.3*
24x14 x130	.0807V	.0723V	11.6
24x12 x100	.0990V	.0886V	11.8
24x10 x 85	.1045V	.0922V	13.2
24x 9 x 74	.115 V	.101 V	13.8
22x13 x108	.1034V	.0908V	13.6*
22x 9¾x 83	.1097V	.0947V	15.8*
22x 8½x 58	.1403V	.1196V	17.3*
21x13 x101	.117 V	.106 V	10.5†
21x 9 x 77	.128 V	.113 V	12.6†
20x12 x125	.089 V	.079 V	12.6
20x 9 x 80	.117 V	.103 V	13.5
20x 8 x 55	.154 V	.135 V	13.7
18x11¾x 86	.140 V	.126 V	10.8
18x 8¾x 70	.142 V	.125 V	12.8
18x 7½x 47	.191 V	.170 V	12.4
16x12 x 76	.168 V	.152 V	10.5
16x 8½x 58	.186 V	.166 V	12.1
16x 7¾x 40	.240 V	.214 V	12.2
15x11 x 91	.144 V	.128 V	12.2
15x 7½x 60	.171 V	.151 V	13.4
15x 6¾x 39	.250 V	.222 V	12.5
14x14½x 87	.186 V	.169 V	10.0
14x12 x 78	.182 V	.166 V	9.7
14x10 x 68	.188 V	.169 V	11.1
14x 8 x 53	.217 V	.194 V	12.1
14x 6¾x 33	.298 V	.269 V	11.7
12x12 x 65	.230 V	.209 V	10.4
12x10 x 53	.262 V	.237 V	10.4
12x 8 x 40	.311 V	.281 V	10.6
12x 6½x 28	.387 V	.347 V	11.3
10x10 x 49	.324 V	.294 V	10.4
10x 8 x 41	.337 V	.303 V	11.1
10x 5¾x 23	.464 V	.417 V	11.4
8x 8 x 31	.473 V	.428 V	10.7
8x 6½x 24	.580 V	.523 V	11.1

* Not rolled by Carnegie. † Not rolled by Bethlehem.

TABLE II—HORIZONTAL AND VERTICAL SHEAR IN BUILT-UP PLATE GIRDERS

Girder	S_h	V/a	Excess Per Cent
(1) Web 36x¼ plate flange, 2 L's 4x3x⅜	.1266V	.1111V	14.0
(2) Web 36x¼ plate flange, 2 L's 5x3½x⅜	.1252V	.1111V	12.7
(3) Web 36x5/16 plate flange, 2 L's 5x3½x½	.1197V	.0889V	13.4
(4) Web 48x5/16 plate flange, 2 L's 6x4x½	.0753V	.0667V	13.0
(5) Web 48x⅜ plate flange, 2 L's 6x4x½	.0637V	.0555V	14.8
(6) Web 48x½ plate flange, 2 L's 6x4x½, 1 plate 14x1	.0443V	.0417V	6.2
(7) Web 60x½ plate flange, 2L's 6x6x⅝, 1 plate 14x1	.0360V	.0333V	8.1
(8) Web 60x⅝ plate flange, 2 L's 6x6x¾, 1 plate 14x1¼	.0290V	.0267V	8.9
(9) Web 60x⅝ plate flange, 2 L's 6x6x¾, 1 plate 14x2	.0280V	.0267V	5.1
(10) Web 72x⅝ plate flange, 2 L's 6x6x¾, 1 plate 14x2	.0235V	.0222V	5.9

Distance back to back of angles assumed one-half inch more than the depth of web plate.

TABLE III—RATIOS SHEARING TO BENDING DEFLECTION

Conditions of Loading	Bending Deflection A_b	Shearing Deflection Wood Rectangular Section A_w	Shearing Deflection Steel Web Plate A_s	Ratio $\dfrac{A_w}{A_b}$ Wooden Beams	Ratio $\dfrac{A_s}{A_b}$ Steel I-beams
Case 1—Load W at free end of cantilever......	$\dfrac{Wl^3}{3EI}$	$\dfrac{6}{5}\,\dfrac{Wl}{AG_w}$	$\dfrac{Wl}{AG_s}$	$1.2\left(\dfrac{d}{l}\right)^2$	$7.5\left(\dfrac{r}{l}\right)^2$
Case 2—w lb. per foot on cantilever—uniform	$\dfrac{wl^4}{8EI}$	$\dfrac{3}{5}\,\dfrac{wl^2}{AG_w}$	$\dfrac{wl^2}{2\,AG_s}$	$1.6\left(\dfrac{d}{l}\right)^2$	$10.0\left(\dfrac{r}{l}\right)^2$
Case 3—Load W at center of beams supported at ends	$\dfrac{Wl^3}{48EI}$	$\dfrac{3}{10}\,\dfrac{Wl}{AG_w}$	$\dfrac{Wl}{4\,AG_s}$	$4.8\left(\dfrac{d}{l}\right)^2$	$30.0\left(\dfrac{r}{l}\right)^2$
Case 4—W lb. per ft. on beam supported at ends..	$\dfrac{5\,Wl^4}{384\,EI}$	$\dfrac{3}{20}\,\dfrac{Wl^2}{AG_w}$	$\dfrac{Wl^2}{8\,AG_s}$	$3.84\left(\dfrac{d}{l}\right)^2$	$24.0\left(\dfrac{r}{l}\right)^2$

$G_w = 0.25\,E$ for wood, $G_s = 0.4\,E$ for steel; d = depth of beam, r = radius of gyration; l = length of beam in inches.

TABLE IV—PERCENTAGE SHEARING DEFLECTION TO BENDING DEFLECTION: I-BEAMS. BEAMS SUPPORTED AT ENDS

Depth of Beam In.	Span in Feet 5		7		8		10	
	Load at Center	Load Uniform	Load at Center	Load Uniform	Load at Center	Load Uniform	Load at Center	Load Uniform
12	20.1	16.1	10.2	8.2	7.8	6.29	5.04	4.03
14	27.4	21.9	14.0	11.2	10.7	8.57	6.86	5.48
16	35.8	28.6	18.2	14.6	14.0	11.2	8.96	7.16
18	45.3	36.2	23.1	18.5	17.7	14.1	11.3	9.06
20	56.0	44.8	28.5	22.8	21.8	17.4	14.0	11.2
21	61.8	49.4	31.5	25.2	24.1	19.2	15.4	12.3
22	67.7	54.1	34.5	27.6	26.4	21.1	16.9	13.5
24	80.6	64.4	41.1	32.8	31.5	25.2	20.1	16.1
	8		20		12		15	
26	36.9	29.5	23.6	18.8	16.4	13.1	10.5	8.40
27	39.8	31.8	25.5	20.4	17.7	14.1	11.3	9.06
28	42.8	34.2	27.4	21.9	19.0	15.2	12.2	9.76
30	49.2	39.3	31.5	25.2	21.8	17.4	13.9	11.2
33	59.5	47.6	38.0	30.4	26.4	21.1	16.9	13.5
36	70.8	56.7	45.3	36.2	31.5	25.2	20.1	16.0

to 0.02 in. and in some cases to as little as 0.006 in. Shearing deflection should also be considered when investigating deep girders or short spans for deflection. Believing that shearing deflection is sometimes neglected where it should be considered, the author has compiled several tables that may be useful to the busy engineer, by virtue of the fact that ratios of shearing to bending deflections are given for various sections and conditions of loading. Table III gives deflection ratios for the four most common cases of loading. In Table IV ratios are given for a selected list of steel I-beams. In the latter table the shearing stress is considered uniformly distributed over the web, G_s is assumed to be $0.4E$ and r is assumed to be $0.41d$, or $r^2 = 0.168d^2$. Since the percentage of shearing to bending deflection varies directly as the square of the depth and as the square of the reciprocal of the length, the ratios for depth and length not tabulated can easily be obtained from the table. Thus the tabulated percentage of 12-, 14- and 16-in. beams are the same as those for 6-, 7- and 8-in. beams of one-half the span given.

In examining plate girders for shearing deflection, it is safe to assume that the web alone resists all of the shearing stresses and that the shear is uniformly distributed.

LETTERS TO THE EDITOR

Bearing Plates for Bridges

Sir—I have read with interest the letter from T. H. Addie, president of the American Manganese Bronze Co., which was published in the Oct. 15 issue of *Engineering News-Record*. Mr. Addie is correct in his contention that the California friction tests on bearing plate materials were primarily for the purpose of determining the best practice where the unit load does not exceed 700 lb. per sq.in. However, the information secured as the result of these tests indicates that similar results would have been secured for loads somewhat in excess of the test load.

This is a matter, however, concerning which there is no definite information, and an entirely new series would be necessary if it is deemed of value to carry the investigation farther into a study of the higher unit loads which might be used in long spans. The tests extended over a period of about a year, during which period a mass of information was accumulated which could not be used in the published article due to lack of space.

We were, of course, aware from the start of the arguments advanced in favor of using plates of different chemical composition, and for this reason the first change in our specifications was to provide that the two plates should so differ. Subsequently, however, when we determined that the real answer appeared to be in using a bronze that would be soft enough to permit abrasion of the surface and the formation of a powder rather than a material which would be so hard at to resist abrasion and cold weld under a few movements, we decided that we were unduly technical in requiring that the two castings be of different composition provided they were of non-corrosive material. Such information as we have been able to accumulate indicates that difference in chemical composition is more important in connection with high-speed bearings than where there is a slow short sliding motion.

Mr. Addie states, "the question of friction is not a factor that deserves serious consideration as long as the two bearing surfaces are not actually corroded together." If this is a correct conclusion, it should be possible to eliminate bearing plates entirely. It would be necessary only to finish the concrete seat of the pier or abutment to a hard smooth surface and then to separate the girder from the seat with a thin sheet of tar paper or any other material suitable for breaking the bond, thus giving a bearing of concrete on concrete. It is my understanding that this is the practice in some Eastern states. In California, however, we have found this method of construction to be unsatisfactory and to result ultimately in a spalling of the concrete seat or a cracking in the girder due to the high frictional resistance at the expansion joint.

To ascertain the extent of this friction we made tests of concrete on concrete and found the friction to be so great (even when the concrete plates were given a very smooth surface) as to result in a failure of the concrete under the 700 lb. per sq.in. load before the frictional resistance could be overcome.

Mr. Addie states further, "as far as wear is concerned, the movement, generally speaking, on expansion plates is only one return trip of a fraction of an inch or perhaps a little more per year." It is conceivable that such a movement might take place daily if the temperature range is great enough to cause an expansion or contraction which is not taken up within the member before the frictional resistance is overcome and sliding on the expansion plates occurs. However, even on a daily cycle these movements would be so relatively small in number that we need have little concern as to the wear or abrasion of the plates. Our tests showed that it takes considerably in excess of 5,000 movements to abrade the 10 per cent lead bronze plates sufficiently to cause trouble; whereas in the case of the harder bronzes amalgamation or cold welding takes place after a very few movements.

T. E. Stanton,
Materials and Research Engineer,
California Division of Highways.

Sacramento, Calif.,
Oct. 27, 1931.

Safety in Sludge-Gas Collection

Sir—In view of the tragic and costly explosion of digestion tanks at Woonsocket, R. I., on Oct. 2 (the second such occurrence in about a year) a word about the design and handling of sludge-digestion tanks would seem to be in order. Such accidents are avoidable when the principles of sludge-gas production are understood. Mixtures of gas and air are inflammable when the gas constitutes between 5 and 50 per cent of the mixture, or in any mixture that is respirable. Therefore, when we ventilate a sludge tank to prevent asphixiation we automatically produce explosive mixtures unless the ventilation is carried to such an extent that the gas is entirely removed. Further, if there is any sludge in the tank, it is necessary to provide continuous forced ventilation, as sludge generates gas continuously, and what may be a harmless mixture one moment may become dangerous the next. This is particularly true since sewage gas diffuses sluggishly and the mixture may vary widely in different parts of the tank.

For these reasons tests of the gas in a tank are of little use in predicting safety. It is a simple matter to test for carbon dioxide, and we may assume that the methane content will be from three to five times the CO_2 content. Therefore, even 1 per cent of CO_2 would indicate danger, but its absence would not indicate safety.

In a recent case in New York State, when it became necessary to send men into a digestion tank to make changes in a revolving sludge-stirring mechanism, those in charge felt perfectly safe after they had filled the tank with sewage to displace the gas. They were, in fact, safe only in case the tank had been filled to overflowing with the sewage, and in case there was no sludge in the tank after the sewage used to displace the gas had been withdrawn.

In the Woonsocket case we are told that the tank had been partly emptied and that the covers had been removed for ventilation before sending men in to repair the stirring mechanism. The removal of the covers simply provided ideal conditions for producing an explosive mixture. It is not necessary to seek the source of the spark that starts combustion. There is abundant proof that combustion has started in a number of cases, and our safety lies in avoiding explosive mixtures.

In southern New Jersey, about a year ago, a tank with a concrete cover above the sludge line blew up, causing havoc with the adjacent glass sludge-bed covers, but fortunately there was no loss of life. This explosion was blamed on the curiosity of two visitors to the plant after hours. The fundamental fault, however, lay in providing space for gas between the sludge surface and the concrete cover. Such conditions should not be tolerated. In this case there was an overflow or vent pipe leading from the upper part of the sludge tank to the inside of the glass inclosure. Such an arrangement is exceedingly dangerous, as it offers an opportunity for air-gas mixtures and also for ignition of the mixture within the glass inclosure.

In repairing leaks in gas holders, the experienced gas man does not attempt to ventilate the tank to remove the gas. On the contrary, he raises the pressure within the tank, makes sure that only air-free gas is pumped into the holder, and then repairs the leak by welding on the outside.

Applying the principles outlined, we should: (1) attempt to collect sludge gas only under positive pressure; (2) avoid sending men into any tank containing sludge whenever possible; (3) provide powerful, continuous, forced ventilation with blowers of sufficient capacity to keep all the air moving freely when it is imperative to send men into tanks containing even a small quantity of sludge; (4) avoid designs that provide gas space within the digestion tank, vents or overflows, which may provide connection with the atmosphere; and (5) avoid unnecessary mechanisms, such as stirring devices, which may require mechanical attention.

JOHN R. DOWNES,
Supervising Engineer,
Plainfield Joint Sewage-Works.

Bound Brook, N. J.,
Oct. 26, 1931.

Hemispherical Gate in Kentucky

Sir—The idea of a hemispherical gate, described by A. J. Ackerman in *Engineering News-Record* of Oct. 15, 1931, is not new, although his scheme for handling this gate on a trolley and storing it in a pocket adjacent to the tunnel is probably new.

In 1923 we installed a hemispherical gate, 28 ft. in diameter, designed for a head of 225 ft., for closing the portal of the diversion tunnel of the Dix River dam, Kentucky. This gate was hinged at the top and held in its suspended position until ready to close the diversion tunnel and store water ahead of the dam. It was then lowered to closed position with cable.

The hemisphere in this case was riveted and contained a circumferential double-butt strap joint with clearance within the butt straps between the main plates, in which was placed a $\frac{3}{8}$-in. copper tube, which was carried up the hillside to above water level.

Closing of the dam was affected by this gate prior to completion of the dam, and the copper tubing in the joint was provided to permit filling with nitro-glycerine and shooting out the center portion of the hemisphere in the event that a flood should tend to overtop the dam before completion. Fortunately, this feature was never used.

When the dam was completed to final height, the tunnel for about 30 ft. back of the gate was filled with concrete.

L. F. HARZA,
Harza Engineering Co.

Chicago, Ill.,
Oct. 20, 1931.

Jack-Knife Type Bridges

Sir—In your Nov. 5 issue is a description of the old jack-knife type bridges of the Boston & Maine R.R. in Boston that are now being removed, and in the editorial discussing them the statement is made that this type of bridge was probably not used outside of New England and its originator is not known.

The Lake Shore & Michigan Southern Ry., now a part of the New York Central system, maintained for many years a bridge of this type in Sandusky, Ohio, on its so-called "Shore Line," which in recent years gave access to the waterfront of the town from the main line, which now passes some distance from the water. When first built this bridge probably carried such main-line tracks as there were prior to the building of the more direct route. It was dismantled about fifteen years ago after two coupled engines ran through the open span.

C. H. SONNTAG,
Plant Manager,
Lawrence Portland Cement Co.

Thomaston, Me.,
Nov. 9, 1931.

Too Many Engineers in City Service

Sir—The letter of W. C. Hogoboom, on p. 666 of the Oct. 22 issue of *Engineering News-Record*, regarding public engineering work, brings out a point which to me is the basis of unemployment of engineers; that is the practice of the city and county engineering departments of taking on the work of private engineering.

If the engineering societies would take up the matter and see that the city and county would handle only the work for which they were organized, there would not be so many city and county engineers to be turned out because of the urging of realty boards when taxes are high.

The private engineers would have work and the smaller number in the public office would not attract the attention of the realty boards.

JOHN W. MEEHAN,
Civil Engineer.

Mount Vernon, Wash.,
Oct. 28, 1931.

Frozen Concrete Used in Minneapolis

Sir—Referring to the article "Frozen Concrete Used in Russian Buildings," in your issue of Aug. 6, it may be of interest to recall that this method was used in Minneapolis more than twenty years ago, and that one of the buildings in which it was employed, the Meyers Arcade, still stands at the corner of 10th and Nicollet Ave.

Your article was clipped and sent to J. E. Meyers; I quote from his reply.

> We used mortar made from sand cement in laying the rubble foundation of the Meyers Arcade. The temperature was 20 below. I protested to E. J. Davis, the contractor, about laying the foundation at that low temperature. He stated that he had heard that the concrete would set while frozen, and, of course, so would this mixture, and it was used, as I recall it, four to one. He made guarantee of replacement under architectural supervision if any weakness was found in the structure within a year, thus enabling it to thaw out. The wall was laid in January. It was left to freeze, being a cellar wall covered in on the side by the earth filling, and covered on top by straw while it froze. Tnen the brick structure was laid and the building erected. There was no chance for any freeze and thaw action.
>
> We also laid, in like manner, the concrete slab over the coal storage room. In August of that year we attacked the structure with cold chisels and found that the stone was more easily broken than the cement or concrete. It made a perfect foundation and always has been so. It was the first or second year that it was attempted in Minneapolis. This was in the winter of 1909 and 1910.

H. H. MUIR,
Engineering Department,
Mead Morrison Mfg. Co.

Chicago, Ill.,
Oct. 19, 1931.

NEWS OF THE WEEK

Seeks to Invalidate Colorado Aqueduct Bond Issue

Suit has been filed in the superior court in Los Angeles, Calif., by J. E. Burney, a Long Beach taxpayer, seeking to invalidate the $220,000,000 Colorado River aqueduct bond issue voted last September by residents of the Metropolitan Water District of Southern California. The suit was an answer to the petition of the water district's board of directors that the issue be validated in order that the bonds could be sold and a start made on the construction of the aqueduct. Mr. Burney asserts that the legislative act of May 10, 1927, creating the water district is unconstitutional.

◆

Power Development in Ottawa River in Prospect

A preliminary step toward further extensive power development on the Ottawa River below Lake Temiskaming was taken recently when the Quebec government passed an order-in-council authorizing its minister of lands and forests to accord to the Gatineau Power Co. control of the Ottawa River, within the province, from the Temiskaming dam down to Allumette Lake, a distance of 80 miles. Issuance of power development rights to the Gatineau Power Co. is subject to ratification of an agreement by the Province of Quebec, the federal government of Canada, the Ontario Hydro Electric Power Commission and the Gatineau Power Co.

Designer of Failed Coal Pocket Guilty of Manslaughter

PROSECUTION of the designer of a coal pocket in the Bronx, New York City, the collapse of which on Feb. 21, 1930 (*ENR*, Feb. 27, 1930, p. 377, and March 27, 1930, p. 539), caused the death of three men and the injury of eleven others, has resulted in his conviction by a jury for second degree manslaughter, a paraphrased definition of which is "homicide when committed without design to effect death but resulting from any act, procurement or culpable negligence of any person."

The jury recommended clemency and on Nov. 28 Judge L. Newman Bertram, of Elmira, N. Y., before whom the case was tried in the Bronx county court, sentenced the designer, Paul Orzel, to 7½ to 15 years in state's prison but stayed execution, thus permitting serving the sentence outside of prison walls provided certain stipulations are met. Among these is an absolute restriction upon Mr. Orzel from doing any structural design or planning except under supervision of a licensed professional engineer, who shall be responsible for his work.

Following the collapse, two indictments, one for manslaughter and the other for practicing engineering without a license, were brought against the designer. Convictions have now been se-

(Continued on page 902)

Ohio Finds Money for Additions to State Instituttions

In spite of the defeat of the $7,500,000 bond issue, the department of public welfare of Ohio announces that projects will be initiated for improvements at various state institutions. The money has been found through appropriations made by the state board of control. The improvements are to be made in state hospitals and the Girls' Industrial School.

◆

Arkansas Cities Cannot Prohibit Building in Proposed Road Area

The Arkansas supreme court has handed down a decision affirming that of the Lonoke County chancery court, holding that cities and towns cannot arbitrarily prohibit the erection of buildings along extended areas of streets sought to be widened for highway construction. The state highway commission intends at some future time to widen the highway through the town of Cabot, and in support of the plan the Cabot town council passed an ordinance making it unlawful to erect buildings on the proposed highway route within the extended boundaries, a distance of 50 ft.

This ordinance is invalidated by the decision of the court, which holds that the highway commission's attempt to enjoin property owners along the route from proceeding with construction is an indirect attempt to take private property for public use without just compensation, prohibited by the state constitution.

NEW HIGHWAY BRIDGE COMPLETED AT VIENNA, MARYLAND

The Maryland state roads commission on Nov. 10 opened to traffic the recently completed bridge at Vienna, Md., over the Nanticoke River, connecting Dorchester and Wicomico counties. The bridge is of the reinforced-concrete girder type on 90-ft. concrete piles and has a length of 1,016 ft., including an 80-ft. channel opening provided with a double-leaf bascule span. The width of the driveway is 20 ft. The cost of the bridge was about $500,000, divided as follows: for the bridge proper, $240,000; for the approach, $190,000; for lighting, paving, etc., $70,000. The bridge was built by the Sanford-Brooks Co., Baltimore, Md., under direct supervision of the following officials of the state roads commission: Harry D. Williar, Jr., chief engineer; Walter C. Hopkins, bridge engineer; P. A. Morison, district engineer; and Benjamin LeSueur, inspector.

American Engineer on Canadian Railroad Commission

Leonor F. Loree, president of the Delaware & Hudson Co., has been named a member of the royal commission appointed by the Canadian government to inquire into the problems of the Canadian railways and to report to Parliament at the earliest possible date on possible methods of improving their condition. The commission is headed by Lyman Poore Duff, senior member of the supreme court of Canada. Other members are Lord Ashfield, chairman of the London Underground Railway System; Sir Joseph Flavelle and Beaudry Leman, both bankers; Walter C. Murray, president of the University of Saskatchewan, and J. C. Webster. Broad powers of inquiry have been given to the commission and it is expected that it will go into such matters as duplication of facilities, competition between railways and between railways and highway transport lines, and possibly railway rates.

❖

Hoover Dam Notes

A total of 502 ft. of 41x56-ft. enlarged headings in the diversion tunnels were driven during the week ended Nov. 21. Enlarged headings are now being driven from both inlet and outlet portals of tunnels Nos. 2, 3 and 4. To date there has been a total of 1,742 ft. of these headings excavated. The 12x12-ft. pioneer tunnels have been completed from portal to portal in tunnels Nos. 2 and 3, tunnel No. 2 holing through Nov. 19.

The total length of all four diversion tunnels will be 15,935 ft., divided as follows: No. 1, 4,301 ft.; No. 2, 3,892 ft.; No. 3, 3,560 ft.; No. 4, 4,182 ft. Pioneer headings on Nov. 21 totaled 12,915 ft.

Rough grading of the Black Canyon highway has been completed. Finishing operations are now in progress. Detailed drawings for the low-level concrete plant have been submitted by Six Companies. Piledriving is under way for the railroad trestle across the Colorado at the Arizona gravel pits, 7 miles above the dam.

Holders of Boulder City permits who have not as yet made a start toward establishing their businesses must do so within 30 days and must complete their facilities within 90 days to hold their permits.

A second injunction has been granted Six Companies preventing interference with its work by the State of Nevada. A temporary restraining order was granted by Federal Judge Norcross on Nov. 23 stopping seizure of Six Companies' property by the county assessor of Clark County for alleged non-payment of $6,808 taxes for 1931. A previous order restrained the state from stopping the use of trucks in the diversion tunnels, held to be a violation of state mining laws. Both issues are expected to come to trial to determine the state's power to collect taxes and enforce its laws within the government reservation surrounding the dam project.

❖

Japanese Engineer Honored

Prof. Kyoji Suyehiro, director of the Earthquake Institute, Imperial University, Tokyo, Japan, was the guest of honor at a luncheon held in the Engineers Club, New York, on Nov. 24. Francis Lee Stuart, president of the American Society of Civil Engineers, presided and John R. Freeman introduced Prof. Suyehiro, characterizing him as the world's foremost authority upon earthquake phenomena as they affect structures.

Prof. Suyehiro has come to this country as the guest of the American Society of Civil Engineers to deliver a series of lectures at universities on the Pacific Coast, before some of the federal department heads in Washington and at M.I.T. in Boston.

Plans Blocked for Dam in San Gabriel Canyon

Plans of the Los Angeles, Calif., county flood-control district to start construction of a 275-ft. dam in San Gabriel canyon on a site designated as No. 1 have been blocked by the San Gabriel Canyon Development Co., owner of numerous gold-mining claims, which has denied the county permission to make explorations. The county proposes to build two dams in the canyon as a substitute for the plan to build one high dam. The balance of a $25,000,000 bond issue voted in 1924, amounting to $22,500,000, will be used for construction of the proposed two lower dams. The sites of the two proposed dams are above and below the site of the abandoned high dam.

The San Gabriel Canyon Development Co. has offered the county an easement to the properties for $175,000. About 62 gold-mining claims are involved. The county's counter-proposal of $50,000 was refused by the company. The county board of supervisors is considering whether to await a federal hearing on claim cancellations or to proceed with condemnation action in the courts.

❖

Yakima Siphon Break Caused by Cracked Tunnel Lining

A preliminary investigation on Nov. 19 of the interior of the inverted siphon carrying the North Branch canal under the Yakima River on the Kittitas division of the Yakima reclamation project revealed that the break in the siphon, occurring Aug. 23, was caused by excessive cracking of the unreinforced-concrete lining in the horizontal section of the tunnel. At the time of the break the tunnel had been in use 2½ months and there had been no previous indication of weakness in the tunnel or overlying strata.

The North Branch canal crosses the Yakima River in an inverted siphon in tunnel, having a total length of 3,649 ft. and operating under a maximum head of 523 ft. The pressure tunnel is circular in section, 9 ft. 3 in. in diameter inside of concrete lining. At its lowest point it is 142 ft. below the normal water surface of the river. It is equipped with an automatic wasteway consisting of a riser, the upper end of which contains two 42-in. balanced needle valves. The inclined legs of the tunnel are at an angle of 55 deg. with the horizontal (*ENR*, Nov. 14, 1929, p. 765).

On the morning of Aug. 23 without warning a blow-out occurred in the tunnel, a stream of water spouting out at the lowest point near the wasteway shaft house. At that point the cover is 150 ft. thick, and although seamy, was considered ample. Arrangements were made to unwater the tunnel, and on Nov. 16 a large pump was put to work. In less than two days the tunnel was unwatered.

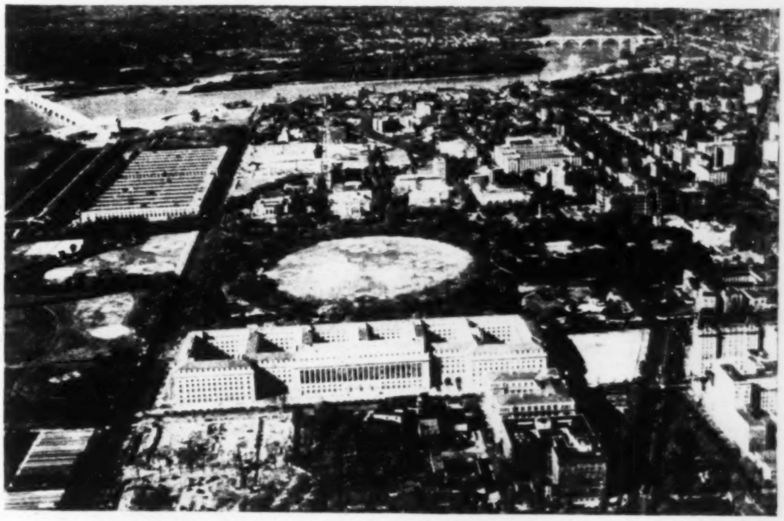
According to a construction engineer of the Reclamation Bureau who made a first-hand investigation of the tunnel,

MOVING ROCK ON THE HOOVER DAM JOB

Night and day shifts are operating the heavy equipment which must move millions of yards of material under adverse conditions during the eight-year construction period on the Hoover Dam. The trucks here shown are equipped with steel cabs to protect the drivers from falling rock.

the entire horizontal leg of the tunnel was found to be damaged. The plain concrete lining is cracked throughout, the cracks running horizontally and varying from upper to lower quarter points. The worst condition is found 100 ft. north of the wasteway shaft, where a considerable stretch of lining is badly cracked but still standing. The reinforced sections of lining are undamaged. South of the wasteway shaft the lining is cracked with maximum openings of about 1 in., which might be repaired by grouting.

The bureau has ordered steel lining to be placed within the damaged portions of the unreinforced-concrete lining. The shaft and inclined legs of of the tunnel were not damaged.



NEW HOME OF U. S. DEPARTMENT OF COMMERCE

The U. S. department of commerce will move into its new $17,500,000 home during the first week in January. The first event in the new building was the dedication, Dec. 2, of the auditorium by President Hoover, who was secretary of commerce when construction of the building was begun.

◆

Grade-Crossing Elimination in New York State

The Public Service Commission of New York State has announced its approval of a list of railroad grade crossings in the state to be considered for elimination during 1932. The list includes 170 projects and the estimated cost of the eliminations is $72,839,000, of which $18,771,100 is for new projects and $54,067,900 is for projects carried over from the 1931 program. Hearings will be held on each project before a final order is entered. Half the cost of elimination is paid by the railroad companies affected, 49 per cent is paid by the state and the remaining 1 per cent by the county in which the crossings are located.

◆

U. S. Court to Pass on Validity of Golden Gate Bridge Bonds

Within three days after the approval of the Golden Gate Bridge bonds and the district's power of taxation by the California supreme court, the case was taken into the U. S. district court. On Nov. 26 the state supreme court upheld the validity of the $35,000,000 bond issue, permitting the district to levy taxes in the district to pay bond principal and interest should the income from the bridge fail to meet such demands. The taxation privilege was added to the powers of the Golden Gate Bridge and Highway District by a legislative amendment of 1931. The case was brought before the state supreme court when a contract was awarded for the purchase of a $6,000,000 block of the bonds to a San Francisco syndicate conditional upon a state supreme court ruling on the validity of the district's taxation power to secure the bonds.

Now the case has been taken into the federal courts by taxpayers in a suit entered under the name of the Garland Company, Ltd. This suit asks the U. S. district court to declare the entire structure of the district null and void, stating that the issuance of bonds by the district would subject every taxpayer in San Francisco to discriminatory and unfair taxes, and asks a temporary restraining order to prevent any further plan for the sale of the bonds. The opponents state that they have no opposition to the building of the bridge but want financing assured without taxation.

◆

Date Proposed for Ending Sea Pollution by New York

June 1, 1933, is the date on which New York City should be permanently prohibited from dumping garbage at sea, according to a report submitted to the U. S. supreme court by Edward K. Campbell, special master, in the suit brought by the State of New Jersey to stop pollution of its beaches by floating garbage. The report urges that until that time New York City be required to file, on April 1 and Oct. 1 of each year, reports on the progress of construction of disposal plants, which should also state the amount of garbage and refuse still being dumped at sea.

At the present time, according to the master's report, New York City has in operation 22 incinerators with a rated total capacity of 4,410 tons per day. Fifteen of these have actually consumed, during a peak week, 10 per cent more garbage and refuse than their rated capacity. Garbage from the boroughs of Manhattan and the Bronx is being dumped at sea at the average rate of 3,000 tons daily. Manhattan has three incinerators rated at 940 tons per day; the Bronx has none. The city's department of sanitation has presented a comprehensive program calling for the construction of five incinerators in Manhattan costing $5,575,000; four in the Bronx, $6,250,000; and five in Queens, $5,375,000. These should be sufficient for all requirements until 1945.

To care for immediate needs and to eliminate sea disposal the department has completed plans for four 750-ton incinerators—one in Manhattan, two in the Bronx, and one in Queens. Three sites have already been acquired, and the fourth has been certified for purchase. Appropriations sufficient to build these four plants have already been made, but as some changes in plans have since been decided upon it will be necessary to reallocate these sums through action by the city's board of estimate and apportionment. No difficulty is expected on this score.

Counsel for the two contending parties having agreed upon the terms of the proposed decree, it is probable that the court will approve it.

◆

Twin Cities Working on Sewage-Disposal Plan

The governor of Minnesota has vetoed the metropolitan drainage act (see *ENR*, Sept. 10, p. 429), under the terms of which the cities of Minneapolis and St. Paul were to proceed jointly with the construction of a sewage-disposal plant. Consequently the only possible procedure now is for the two cities to proceed under the plan proposed by the Metropolitan Drainage Commission. This commission, of which J. A. Childs is chief engineer and secretary, has been working for some years on plans for the disposal of the sewage of the Twin Cities and surrounding territory, and the purpose of the commission now is to have these plans analyzed in order that a definite procedure may be submitted.

George M. Shepard has been appointed chief assistant engineer of the commission, effective Jan. 1. Frederick Bass, professor of civil engineering, University of Minnesota, and A. S. Milinowski, consulting sanitary engineer, of St. Paul, have been appointed consulting engineers, effective at once.

WASHINGTON NOTES

By PAUL WOOTON

Washington Correspondent

Entire Flood-Control Act May Be Reviewed by Supreme Court; Louisiana Loses Freight Rate Case

The U. S. supreme court has agreed to review the Kincaid flood-control case, which involves the question whether the federal government must acquire property or flowage rights before beginning construction work on the proposed diversion from the Mississippi River into the Boeuf basin. It also involves the general question as to what constitutes a taking of property under the Constitution.

The suit was originally brought in the United States court for the western district of Louisiana, which issued an injunction against proceeding with the construction of the floodway until property within it had been acquired by the United States. Since the district court's opinion met with the approval of the circuit court of appeals, some were of the opinion that the supreme court might decline to review it. It now is believed, however, that the supreme court will make a study of the entire flood-control act. This conclusion is reached because an understanding of the entire statute is necessary to determine the points involved in this case. If this assumption is true, the court in its decision may discuss the legal problems of flood control broadly and remove much uncertainty in connection with the prosecution of the flood-control plan. The case will be argued orally before the court Jan. 4.

Louisiana Loses Freight Rate Case

Efforts of the Public Service Commission of Louisiana, extending over many years, in behalf of lower freight rates for roadbuilding materials when consigned to public agencies, have been finally defeated by a decision handed down by the U. S. supreme court. These special rates were from 20 to 48 per cent lower than the interstate rates. In its decision the court pointed out that there are many points in Texas, Arkansas and Oklahoma not far from the Louisiana line where large quantities of roadbuilding materials are produced. The high court concurred with the Interstate Commerce Commission in the conclusion that the operators of those properties were discriminated against by Louisiana rates and in that way the rates became an illegal obstruction to interstate commerce.

Income Tax Returns of Construction Concerns

Income tax returns for 1930 were submitted by 19,385 corporations engaged in construction work. Of that total 8,643 had a gross income of $2,039,248,339. The net income of those corporations totaled $143,241,946. A total of 9,338 companies had gross incomes aggregating $832,346,257, but incurred deficits amounting to $79,190,243.

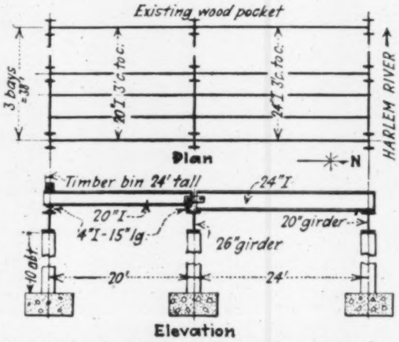
Designer of Failed Coal Pocket Guilty of Manslaughter

(Continued from page 899)

cured on both counts. The manslaughter trial began on Nov. 4 and ended on Nov. 13. The jury was out less than three hours. The case has attracted wide attention because of its unprecedented character; the district attorney of Bronx County, who conducted the prosecution, was unable to find a similar case in New York State.

Testimony brought out at the trial reveals new and interesting information concerning the coal pocket and the contract arrangements under which it was built.

The coal pocket consisted of a five-section timber bin 38 ft. wide, 119 ft. long and 24 ft. high, carried on a structural steel framework about 10 ft. high, resting on concrete footings in filled ground along the Harlem River. Between it and the river was an existing coal pocket of about the same size, built entirely of timber. The new coal pocket was designed to hold 2,700 tons of pea coal. At the time of failure one section was full (having been filled the previous day immediately after the pocket was completed) and the next section was being filled by dropping the coal in from the top at the rate of 260 tons per hour. Both these sections collapsed, trapping the men who were working beneath.



Steel framing in two bays of coal pocket that collapsed

It was developed at the trial that the McNulty Bros. Coal Co. had entered into a contract in August, 1930, with Christ Nilsen, a Brooklyn contractor who had had previous experience in building coal pockets. Plans were prepared for a five-section timber pocket with four sections supported on timber bents and one on steel. These plans were submitted to the dock department, which has jurisdiction over waterfront property, and apparently were approved, although no permit was issued because of some question regarding ownership of the land upon which the coal pocket was to be built. When Nilsen made inquiries from the Central Structural Steel Co. for the material in the one steel bay, Nathan Goldstone, president of this company, suggested steel supports for the entire pocket. Subsequently the change was agreed to by McNulty Bros., but the revised plans were never filed with the dock department. Nilsen gave Goldstone the set of plans that had been approved by the dock department, with instructions to furnish structural steel supports, the only stipulation being that the columns of the new pocket should line up with those in the existing adjacent pocket. Mr. Goldstone turned the plans over to Mr. Orzel, who had had some years of experience as a structural steel detailer, at the same time furnishing him with a list of sections that the Central Structural Steel Co. had in stock. Orzel submitted a design and was paid $200 by the Central Structural Steel Co.

The framework that collapsed is shown in the accompanying sketch. The piling of members one on top of the other instead of framing them together is a notable characteristic of the design, as is the use of 4-in. sections as shims to bring the tops of the 20-in. beams to the same elevation as the tops of the 24-in. beams in the adjacent panel. The use of the latter detail was inferentially connected with the fact that Mr. Goldstone furnished Mr. Orzel with a list of sections in stock, but no attempt was made to prove that any pressure was brought to require the use of the 20-in. I's and the 4-in. I-section shims. The design provided no bracing in the vertical plane between the columns.

Three Defenses Fail

Of the three defenses that were set up, the first, that the steel work was properly designed, was thrown out on testimony of several expert witnesses; the second, that the steel designer was only required to substitute steel for wood, was declared to be false because the steel sections on the original wood bin plans showed framed members with kneebraces between the girders and columns, a procedure that was not followed in the steel design used; and the third, that the foundations were faulty, was thrown out on the testimony of Samuel Kessler, who has charge of rebuilding the bin and is using the same foundations after a careful examination of their adequacy. According to Mr. Kessler's testimony, the foundations are 8 ft. wide and 4 to 5 ft. deep, while the foundations under the existing bin, which has stood for a number of years, are only 12 in. wide and 12 in. deep, and carry 3,000 to 4,200 lb. per linear foot, while the new foundations will be required to carry only about 1,200 lb.

Two engineers among the witnesses called by the district attorney, Ferdinand T. Loehninger, consulting engineer, New York, and F. H. Frankland, director, engineering service, American Institute of Steel Construction, testified that the collapse of the pocket was due primarily to lack of bracing in a vertical plane plus the failure to frame the several members together plus the use of the 4-in. H-section fillers. It was their opinion that failure probably originated with the crushing of the 4-in. H-section fillers over the second line of the columns, induced both by the heavy coal load and the vibration caused from dropping coal into the bin.

Brief News

Federal Contributions for relief of unemployment in Canada will reach at least $30,000,000, it is estimated by G. D. Robertson, dominion minister of labor.

Municipal Improvements for the city of Houston, Tex., for the fall and winter, consisting principally of street extensions and improvements, have an estimated cost of $1,135,500.

City Manager form of government was voted by the citizens of Ashland, Ky., in the November election by 300 majority. The new form of government will go into effect Jan. 1, 1934.

Construction of the Eleven Mile canyon reservoir for the Denver board of water commissioners has been suspended for the winter, the snow and extreme cold preventing further work. The structure is about half finished.

Expenditure of $500,000 is being considered by the city council of Seattle, Wash., to pave between the street car tracks of the municipal railway, following a ruling by the corporation counsel that unemployment relief funds may be used for this work.

Yugoslavia and Rumania have awarded the contract for the construction of a steel bridge across the Danube connecting the two countries. The contract for the bridge, which will be the largest in southeast Europe, was awarded to a German syndicate.

The Pacific Great Eastern Railway, abandoned for ten years in the gumbo of Cottonwood Canyon, British Columbia, will in all probability be extended this winter from Quesnel to Prince George. This program was forecast recently after the federal government had agreed to pay half the estimated cost of $3,000,000 as a matter of unemployment relief.

Instructions to report on a plan for construction of a 60,000-kw. steam-generating plant by the city of Los Angeles, Calif., at Wilmington, have been issued to a committee of the city's department of water and power by the board of water and power commissioners. Under an agreement between the city and the Southern California Edison Co., Ltd., the city cannot operate a steam plant until May, 1932.

Delay Is Announced in the building of a waterworks system in Mechanicsburg, Ohio, because of a flaw in advertising the proposed bond issue of $65,000. At an election the citizens approved the issue by 354 to 274 and steps had been taken to proceed with the award of the contract when the flaw was discovered. The question of the bond issue will be resubmitted to the voters next year.

An Experimental Flight to determine the practicability of patrolling high-tension transmission lines by airplane was recently made along a line of the Texas Power & Light Co. by Fairchild Aerial Surveys, Inc. Flying slightly above and to one side of the line at a speed of from 80 to 95 m.p.h., it was possible to detect broken insulators, breaks in the line, foreign material obstructing the wires and other defects requiring attention. As a result of this successful test, the power company expects to use planes for emergency patrol work after storms or accidental interruptions of service.

Reaffirmation in its opposition to federal truck regulation was voted by the National Industrial Traffic League at its annual meeting in Chicago on Nov. 18. The league took the position that it is contrary to the public interest to require certificates of convenience and necessity as a condition precedent to operation of either common carriers or contract carriers of freight on the highways and to legislate in regard to rates for highway freight carriers.

Dedication of the $1,250,000 suspension bridge linking Maysville, Ky., with Aberdeen, Ohio, took place on Nov. 25. The structure, which is a state-owned toll bridge, has an over-all length of 3,163 ft. 11 in., with a main span of 1,060 ft. Maximum clearance above high water is 45 ft. The contractors were: for the substructure, Dravo Construction Co., Pittsburgh, Pa.; for the superstructure, John A. Roebling's Sons Co., Trenton, N. J. The engineer for the state was H. R. Creal, Frankfort, and Modjeski & Masters, New York City, were consulting engineers.

On Highway and Bridge Construction during the winter, spring and summer, the Province of New Brunswick, Canada, will spend $1,986,455. The provincial government contributes $994,497 of this and the dominion government $788,197. The remainder will be paid by the municipalities in which the work is planned.

Personal Notes

R. O. Parsons, chief locating engineer of the Kentucky state highway department, has tendered his resignation, to become effective Dec. 31.

Charles E. Bretz, superintendent and engineer of the water department of Oklahoma City, Okla., has resigned. He had been with the department since 1920.

Frank Macy, an engineer and member of the board of directors of the Great Lakes Harbor Association, has been appointed a member of the Municipal Harbor Commission of Rochester, N. Y.

L. L. Lee, for the last 4½ years assistant city manager of Miami, Fla., has been elected city manager, succeeding D. C. Coleman, who resigned recently. Mr. Lee is a graduate in civil engineering from the University of Minnesota, but for the last twelve years has been engaged in newspaper work.

Edgar S. Mauplin, for the past 2½ years area engineer in charge of the northern district of the Vicksburg engineer district, with headquarters at Rosedale, Miss., has been transferred to the second New Orleans engineer district, where he will have charge of the second field area, with headquarters at Baton Rouge, La.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.; annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago; annual meeting, St. Louis, Jan. 26-29.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Pittsburgh, Jan. 27-29.

UPPER MISSOURI RIVER DEVELOPMENT AND CONSERVATION ASSOCIATION was organized recently at Jamestown, N. D., with Henry W. Wilson, New Rockford, president, and Sivert W. Thompson, Devils Lake, secretary-treasurer. The purpose of the organization is to further a water conservation program on all streams and lakes by impounding waters in natural and artificial reservoirs for flood control, navigation, water supply, recreational centers, irrigation, water power, sewage disposal and other economic benefits.

TACOMA SECTION, American Society of Civil Engineers, at its regular monthly meeting on Nov. 9 heard C. E. Putnam, city engineer of Tacoma, on "The Putnam Plan for the Reorganization of the State and County Government of the State of Washington." The purpose of this plan is to check the rising cost of government by the consolidation of certain county and state offices, thereby eliminating waste and expense due to duplication. A. M. Truesdell, bridge engineer of Tacoma, showed moving pictures of the most interesting features of construction of the Eleventh St. viaduct, just completed.

SIXTH ANNUAL HIGHWAY ENGINEERING CONFERENCE will be held at the University of Colorado in Boulder on Jan. 14-15. This year's program will be largely devoted to a discussion of problems encountered in the region in the construction and maintenance of oiled gravel surfaces.

SEVENTH ANNUAL SOUTHWEST ROAD SHOW AND SCHOOL will be held at Wichita, Kan., Feb. 23-26.

ST. LOUIS SECTION, American Society of Civil Engineers, has elected officers as follows: president, F. G. Jonah, chief engineer, St. Louis-San Francisco Railway; vice-presidents, L. R. Bowen and Francis T. Cutts; secretary-treasurer, B. A. Willis.

NEW YORK STATE ASSOCIATION OF TOWN SUPERINTENDENTS OF HIGHWAYS met in Syracuse Nov. 19 with about 150 delegates present. The association went on record as strongly opposed to changes in the present system of town road supervision, especially proposals to abolish town highway superintendents. President Kohler argued that if the town appropriates the money for highways, the money should be expended under the jurisdiction of town officials.

FOUR STATES SECTION, American Water Works Association, will hold its fall luncheon meeting on Dec. 11 in Philadelphia. The speaker will be H. S. R. McCurdy, chief engineer, Philadelphia Suburban Water Co., who will give a talk, illustrated with lantern slides, on "The Springton Dam and Reservoir on Crum Creek."

Construction Equipment and Materials

Suction Lifting Device for Cranes and Derricks

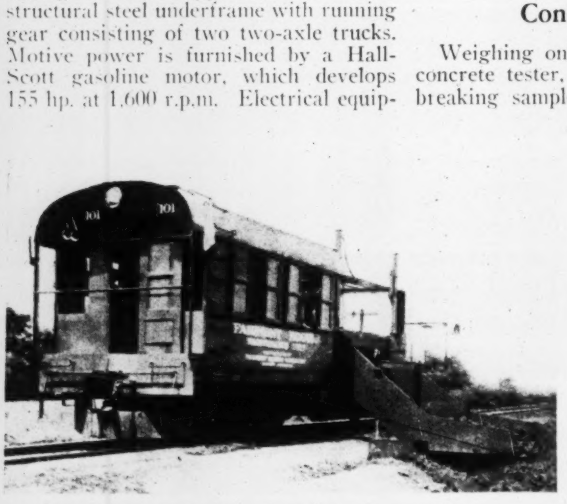
For use where a magnet is inconvenient or unsuitable, the United Engineering & Foundry Co., Pittsburgh, Pa., has developed a suction unit to enable cranes or derricks to handle smooth surfaced, flat materials of which the surface must be preserved, such as highly finished metal sheets, paper, wallboard, glass or lumber. The unit consists of a series of suction cups mounted in a bracket suspended from a boom or bridge. Vacuum is provided by a small motor-driven pump with air lines to the suction cups. Control is through a two-way valve which either applies the vacuum or lets in air for release. Lifting power is determined by the size and number of the cups used. The design lends itself to almost any amount of variation, depending upon the kind of lifting device used and the material to be handled. It is particularly useful in lifting single sheets or plates from a large pile.

◆

Gas-Electric Track Maintainer

Economical shaping of the ballast and roadbed shoulders along a railroad is the function of a gas-electric maintenance-of-way machine now being demonstrated by Fairmont Railway Motors, Inc., Fairmont, Minn. Other functions of this machine include ballast agitation, scarifying and removal, building up subgrade shoulders from ditch sections, plowing snow and flanging ice, spreading materials and spraying oil or chemicals. It can also be equipped with a 3-ton, 35-ft. full-revolving crane.

The machine has a total weight of 43 tons, the mechanical structure consisting of a box-type cab built on a structural steel underframe with running gear consisting of two two-axle trucks. Motive power is furnished by a Hall-Scott gasoline motor, which develops 155 hp. at 1,600 r.p.m. Electrical equipment includes one 250-volt d.c. generator, two 250-volt traction motors, control equipment and meters. Mounted on the outside are a combination subgrade scraper and ballast shaper operated only when the machine is running forward and a ditcher on the opposite side that can be used with either direction of travel. Both of these units are swung out from the machine and lowered to working position by hydraulic pistons operated by oil at 400 lb. per sq.in. This pressure is obtained from a gear pump driven by an auxiliary gas engine. Excess material is disposed of by filling in low places.



Maintenance-of-way machine in operation

◆

Seamless Welded Pipe Fittings

Uniform wall thickness at all points is the outstanding feature of a complete series of seamless pipe fittings for making welded connections announced by Tube-Turns, Inc., 1303 South Shelby St., Louisville, Ky. Material, dimensions and tolerances in all of these products conform with the straight pipe with which they are to be used. The line includes 45- and 90-deg. elbows and 180-deg. return type fittings in all sizes from ¾ in. through 20 in. and in virtually all weights required by modern piping.

◆

Concrete Admixture

Tensilite, an admixture for concrete which is said to increase tensile strength from 400 to 500 lb. over plain concrete and which is chemically inert, is being produced by J. P. Reiff & Co., Drexel Building, Philadelphia, Pa. Tensilite requires no extra water and is a waterproofing material.

◆

Field Testing Machine for Concrete Beams

Weighing only 110 lb., the Edwards concrete tester, a portable machine for breaking sample beams in the field, is being distributed by the Shand Engineering & Sales Co., Columbia, S. C. The tester is constructed on the principle of a simple lever pivoted on a knife edge by which pressure is applied to the concrete beam. The latter rests on two rocker bearings, one fixed and the other hung on the short arm of a lever. Weights are hung on the long arm of the lever and the resul upward pressure on the short arm, act through the suspended rocker beari forces the concrete beam upward agai a bearing at its center. Bearings a accurately spaced and, being of a rocker type, adjust themselves to th warped surfaces of the beam. The stress exerted on the beam is compute in accordance with the length of th two lever arms and the known weigh applied.

Portable concrete beam tester

◆

Business Notes

Division of Simplified Practice, U. S Bureau of Standards, Washington, D. C. is distributing a proposed revision of simplified practice recommendation R87-31 on forms for concrete joist floors. Signed acceptances are requested from manufacturers, distributors and users.

Ohio Power Shovel Co., Lima, Ohio has appointed W. C. Champion Pacific Coast manager, with headquarters at Seattle, Wash.

Al-Oys, Inc., Chicago, Ill., announces the election of C. W. Merriken as vice-president. This organization is exclusive distributor of Pure Asphalt Co. products.

Austin Machinery Corp., Muskegon, Mich., has appointed George M. McCarron district sales manager of the Eastern territory, replacing L. Crook.

L. Charles Miller, formerly an engineer with the Capitol Steel & Iron Co. and later sales engineer for the Concrete Engineering Co., has opened an office in the Hales Building, Oklahoma City, as manufacturers' representative for several construction materials and building products.

Worthington Pump & Machinery Corp., Harrison, N. J., announces the following appointments: J. J. Summersby, assistant general sales manager in charge of resale activities; George B. Cumming, manager of sales of the resale and meter division; Carl E. Oechsle, manager of the contractors division; C. A. Hirschberg, manager of rock drill sales and service.

Truscon Steel Co., Youngstown, Ohio, has taken over the building products division of the Berger Mfg. Co., Canton, Ohio, which will be operated as a division of Truscon.

International-Stacey Corp., Columbus, Ohio, has placed William M. Culbertson in charge of oil country tubular product sales, with headquarters at Columbus. Mr. Culbertson was formerly connected with the Wheeling Steel Corp. and with the Monongahela Tube Co.

James G. Lidgerwood, part owner of the Lidgerwood Mfg. Co., Newark, N. J., died Nov. 30 at his home in Morristown, N. J., of a self-inflicted gunshot wound. He was 52 years old, and had been in ill health for some time.

Charles W. Miller, associated with the Jeffrey Mfg. Co., Columbus, Ohio, for 47 years until his retirement two years ago, died in that city Nov. 27 at the age of 69. He entered the employ of the company as secretary and later became treasurer, retiring to become a trustee of the estate of the late J. A. Jeffrey, founder of the company.

Business Side of Construction

November Contracts, at 35 Millions, Are Lowest of the Year

CONTRACTS for the month of November averaged 35 millions per week, the lowest of the year. This compares with 45 millions in October, 47 in November, 1930, and yearly averages of 50 millions for 1931 and 62 millions for 1930.

Public-works contracts totaled 82 millions for the whole month, against 87 for November, 1930. Increases were recorded in sewers, federal government and unclassified. Roads and buildings declined 26 and 13 per cent respectively. Private building construction was even lower than usual, but unclassified private construction was comparatively heavy. Residential building totaled only 50 millions for the month, compared with 80 millions a year ago.

The Midlle West was the only region to show a gain in both private and public work over November, 1930, though public work increased for the month by 34 per cent in the Middle Atlantic states.

The total for the eleven months was 2,329 millions, compared with 3,000 in 1930, a drop of 22 per cent. The volume of public-works contracts is 4 per cent heavier than last year. The drop is almost entirely in building, and in percentages amounts to 25 for residential, 50 for industrial and 55 for commercial.

Following is the construction volume in various sections of the country as a percentage of 1930 volume for the section:

New England, 72 per cent of 1930 volume; Middle Atlantic, 75; South, 91; Middle West, 71; West of Mississippi, 81; Far West, 93 per cent.

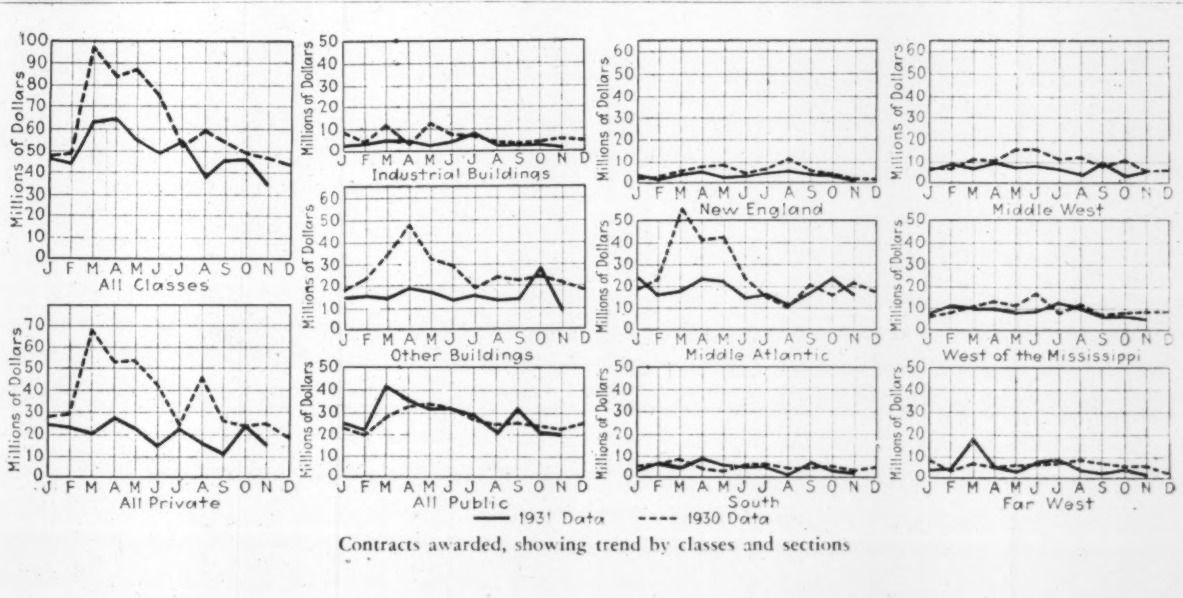
Substantial Price Decreases in Cement, Lumber and Lime

The principal price decreases in a dull market were in cement, lumber, lime and railway ties. Cement dropped 10c. in Chicago and Boston and 3c. in Baltimore, the result of large mill stocks and slack building. The steel base of $1.60 has not changed since July. Although lumber mill stocks are nine times the current volume of unfilled orders, the only important price decline occurred in the New York harbor trade due to heavy accumulations of material.

Cement—Operating capacity for the twelve months ended Nov. 1: 1931, 48.6 per cent; 1930, 64.2; 1929, 67.3. Present production rate of 10,700,000 bbl. a month is 25.7 per cent under that of a year ago; shipments to contractors and dealers of 12,300,000 bbl. are 20.6 per cent below. Nevertheless stocks, 21,000,000 bbl., have increased 2.4 per cent this year. There is a stronger sentiment toward consolidation among the stronger units in the industry. A factor in the situation is the possibility of large British imports, through the liquidation of large stocks of cement made under the gold standard, now removed.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN NOVEMBER, 1931
Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States			Canada, Nov., 1931
							Nov. 1931	Eleven Months		
								1931	1930	
Waterworks	$333	$351	......	$819	$202	$1,611	$3,316	$53,999	$46,321	$489
Sewers	350	1,899	$574	4,044	333	390	7,590	68,028	76,520	918
Bridges, public	257	4,215	414	1,200	245	230	6,561	118,915	103,101	155
Excavations	336	35	60	35	134	42	642	20,080	30,614	229
Streets and roads	2,307	5,255	2,816	2,584	4,035	1,995	18,992	502,085	551,343	1,671
Federal government	419	10,525	2,245	6,026	2,261	748	22,224	264,340	104,145	......
Unclassified, public	250	6,698	300	659	149	344	8,400	80,995	100,637	314
Buildings, public	1,320	5,996	1,191	3,146	1,595	1,058	14,306	233,241	276,925	150
Total public	5,572	34,974	7,600	18,513	8,954	6,418	82,031	1,341,683	1,289,606	3,926
Buildings, industrial	1,131	1,714	800	2,556	2,041	595	8,837	157,755	319,425	20,102
Buildings, commercial	2,200	17,045	900	1,510	1,702	665	24,022	537,813	981,930	295
Bridges, private	....	800	....	....	....		800	11,159	20,083	......
Unclassified, private	242	12,693	....	4,908	5,225	....	23,068	280,635	389,400	240
Total private	3,573	32,252	1,700	8,974	8,968	1,260	56,727	987,362	1,710,838	20,637
November, 4 weeks	**9,145**	**67,226**	**9,300**	**27,487**	**17,922**	**7,678**	**138,758**	....	....	**24,563**
October, 5 weeks	16,663	119,730	18,962	19,691	28,271	21,856	225,173	....	....	9,229
November, 1930, 4 weeks	12,856	82,950	14,605	25,376	31,059	22,488	189,334	....	....	13,580
Eleven months, 1931	173,533	915,892	226,188	361,685	371,179	280,568	....	2,329,045	....	125,094
Eleven months, 1930	255,070	1,217,087	247,554	509,631	457,400	313,702	....	....	3,000,444	175,590



Contracts awarded, showing trend by classes and sections

Steel—Mill prices steady, with shading in warehouse transactions. Recently there was a slight improvement in demand for hot-rolled bars and steel piling, but this has been offset by the small demand for plates and structurals. Fabricated steel bookings are at the rate of 16,000 tons a week, compared with 28,000 last year. Shipments balance new orders.

Pipe — Buying of large-diameter wrought-steel pipe for main supply lines is seasonally slow, with no large demand in sight. There are inquiries for quite substantial tonnages of small-diameter laterals. Small-lot business in cast-iron pipe continues fair, although most municipalities have completed appropriations for this year. No price changes.

Lumber—Reserve stocks (4,766,000,000 ft.) are 898 per cent of unfilled orders, compared with 663 per cent last year. Reduction of retail stocks has been so thorough that dealers are handling most of their orders direct from freight car to job site. This practice is expected to continue. Overstock at mills is chiefly in shed materials. In the West Coast area, for example, there is only a fair supply of structural timbers, stringers and switch ties. Retail yards throughout Wisconsin are doing only about 76 per cent of last year's volume, and retail trade in this state is said to be as good as elsewhere.

Railway Ties—Douglass fir ties on the Pacific Coast are down 1c., to 50c., for green and 18c., to $1.22, for creosoted on size 6x8 in. by 8 ft. f.o.b. San Francisco market. In other species, prices remain at November levels.

Lime — Finishing hydrated prices dropped 50c. per ton in Boston, to $21.50; $2.50 in Atlanta, to $17.50; $4 in St. Louis to $18. Common lump dropped $2.50 per ton, to $12.50, at St. Louis, and 8c. per 180-lb. barrel, to $1.57, at San Francisco.

Linseed Oil—Raw oil at Minneapolis advanced 0.4c. per pound to 9.2c. due to limited seed supply.

Expanded Metal Lath—Principal reductions were in 3.0 and 3.4 weights at New York, amounting to 50c. per 1 sq.yd. Wire reinforcement for concret advanced 13c. per 100 sq.ft., to $3.9 for 78 weight, delivered in less-than carlots from New York warehouse, du to higher less-carload freight rates.

The accompanying table presents comparison of movements in several o the principal building materials thus fa this year as compared with last. All show a decided slump, as might be expected, except cement mill stocks. These have gained 2.4 per cent over the quantity on hand a year ago. The increase in stocks, though comparatively slight, will not aid producers in maintaining firmness of prices.

CONSTRUCTION MATERIALS PRICES, F.O.B., CARLOAD OR BARGELOAD LOTS

	Dec., 1931	Nov., 1931	Dec., 1930	% Drop from 1930
Steel shapes, Pitts., 100 lb.	$1.60	$1.60	$1.60	....
Cement, net., bbl., N.Y.	1.49	1.59	2.00	25.4
Cement, net., bbl., Chi.	1.25	1.35	1.95	35.9
Cr. stone, ¾ in., cu.yd., N.Y.	1.85	1.80	1.85	....
Gravel, ¾ in., cu.yd., N.Y.	1.60	1.60	1.75	8.5
Sand, cu.yd., N.Y.	1.00	1.00	1.00	....
Brick, com., M., N.Y.	10.00	10.00	10.00	....
Pine, 3x12, M. ft., N.Y.	46.75	50.00	53.50	12.7
Paving stone, M.N.Y.	120.00	120.00	150.00	20.0
Wood blocks, 3½ sq.yd., N.Y.	1.95	2.00	2.50	22.0
Asphalt, bulk, ton, ref., N.Y.	12.00	12.00	18.50	35.2
Triangle mesh, 032, 100 sq.ft., Pitts.	.89	.89	.99	10.1
Steel sheet piling, 100 lb., Pitts.	1.90	1.90	2.25	15.6
Railway ties, oak, pl., 6 in., Chi.	1.05	1.05	1.35	22.2
C.-I. pipe, 6 in., ton, Birm.	32.00	32.00	37.50	14.7
C.-I. pipe, 6 in., ton, Burl.	32.00	32.00	37.00	13.5
Average decrease	.....	.....	.....	14.7

	Ten Months 1931	Ten Months 1930	% Ch'g in 1931
Fabricated Structural Steel:			
Bookings, tons	1,691,605	2,485,200	—31.8
Shipments, tons	1,553,464	2,770,000	—44.0
Fabricated Steel Plate:			
New orders, tons	267,624	409,497	—34.8
Steel Ingots:			
Production, tons	22,004,112	35,094,520	—37.1
Cement:			
Production, bbl.	110,435,000	141,327,000	—22.0
Shipments, bbl.	115,167,000	144,272,000	—20.2
Stocks, bbl.	21,138,000	20,697,000	+2.4
Lumber, Softwood:			
Production, M. ft.	7,503,118	10,840,020	—30.8
Shipments, M. ft.	8,044,151	10,422,153	—22.8
New orders, M. ft.	7,716,863	10,071,189	—23.5
Unfilled orders, M. ft.	427,509	687,211	—37.8
Stocks, M. ft.	4,000,975	4,533,450	—11.7
Porcelain Plumbing Fixtures:			
Shipments, no.	46,023	63,565	—27.6
New orders, no.	52,476	78,998	—33.6
Unfilled orders, no.	5,887	31,309	—81.1
Stocks, no.	21,957	31,133	—29.6
Range Boilers:			
Production, no.	451,528	505,163	—10.7
Shipments, no.	457,284	508,989	—10.1
Stocks, no.	25,143	22,519	+11.6
New orders, no.	435,888	498,471	—12.7
Unfilled orders, no.	7,126	22,464	—68.5
Terra Cotta:			
New orders, tons	39,279	67,493	—42.0
Vitreous China Plumbing Fixtures:			
New orders, pcs.	1,358,242	1,598,403	—15.2
Shipments, pcs.	1,428,582	1,797,055	—20.6
Unfilled orders, pcs.	188,969	243,116	—22.6
Stocks, pcs.	506,901	593,492	—14.7

◆

Builders Demand Scale Revisions

From every quarter comes the insistent demand of the builders that the unions in the construction industry take reductions in their official scale for 1932. Although there is widespread cutting under the scale, contractors have been paying and are paying union wages. These contractors demand signed agreements at voluntarily lowered rates for the new year. The Building Construction Employers Association of Chicago announces results of its study of several revisions in official scales, already covered by signed contract between employers and unions in fourteen principal cities. Average reductions per hour were as follows:

Bricklayers, 25c., Detroit, Toledo, New Orleans, Sioux City, Des Moines, Denver, Tacoma.

Plasterers, 23¾c., Detroit, Toledo, New Orleans, Des Moines, Salt Lake City, San Francisco.

Steamfitters and plumbers, 25c., Atlantic City, Baltimore, Tacoma.

Carpenters, 21¾c., Philadelphia, Baltimore, Louisville, Detroit, Sioux City, Des Moines.

Painters, 28c., Baltimore, Portland (Ore.), Tacoma.

The national average wage rate for skilled building trades mechanics is $1.15 per hour, compared with $1.16 in November and $1.39 in December, 1930. The average common labor rate is 45.34c. per hour, compared with 45.59c. in November and 55.03 in December, 1930.

Boston—Eight companies in as many industries either completed or let contracts for new plants along the Boston & Maine R.R. in Greater Boston area during November.

Albany—Prevailing wages must be paid on all work on which state relief funds are used.

Hoboken—Investigations under way by federal labor and treasury departments of alleged violation of prevailing wage law on local post office construction. Carpenters said to receive $8 per day, as against prevailing wage of $13 for Hudson County. Refunding a part of wages to subcontractor also charged.

Newark—The first group of unemployed (500) placed on Essex County road work at 50c. per hour, eight hours per day, five days per week. State will share payroll expense with the county.

New Brunswick—Carpenters of Mid-

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Pile Drivers	Structural Iron Workers	Masons' Laborers	Common Laborers
Atlanta	$1.12½	$0.60@0.70	$0.60@1.00	....	$0.75@1.25	$0.50	$0.20
Baltimore	1.75	.90@1.00	1.00@1.37½	$0.65	1.00@1.25	1.00	.30
Birmingham	.60@1.00	.40@.75	.60@.90	....	.60@.90	.20@.30	.20@.25
Boston	1.50	1.37½	1.37½	1.27½	1.37½	.85	.40@.80
Cincinnati	1.25@1.62½	1.00@1.40	1.00@1.40	1.00	1.00@1.40	.60	.35@.40
Chicago	1.70	1.62½	1.62½	1.62½	1.62½	.97½	.87½@.97½
Cleveland	.90	.75@.85	1.00	1.10	.90@1.00	.50	.30@.40
Dallas	1.00@1.12½	.65@.87½	.75@1.00	.75@1.00	1.00	.35@.50	.20@.25
Denver	1.00@1.12½	.75@.87½	.75@.87½	....	.75@.87½	.50	.30@.50
Detroit	1.00@1.50	.60@.80	1.00@1.10	1.00@1.10	1.00@1.25	.50	.30@.50
Kansas City	1.62½	1.32½	1.37½	1.37½	1.37½	.82½	.25@.75
Los Angeles	1.00	.75@.87½	1.00	1.00	.87½@1.00	.87½	.50
Minneapolis	1.00@1.10	.75@.85	.80	....	.80	.45	.40@.45
New Orleans	.60@.80	.40@.50	**1.12½**	.90	.80@1.12½	.50	.15@.25
New York	1.92½	1.65	**1.92½**	**1.78¾**	1.92½	**1.23¾**	.50@.93¾
Philadelphia	1.50	.90@1.00	1.02½@1.36	**1.00**	1.37½	.40	.40
Pittsburgh	.70@1.75	.70@1.50	.70@1.50	....	.70@1.50	.50	.50
St. Louis	1.75	1.50	1.60@1.75	1.25	1.75	.87½	.30@.87½
San Francisco	1.37½	1.12½	1.12½	1.12½	1.37½	.87½	.58¾@.68¾
Seattle	87½@1.50	.62½@1.12½	1.12½@1.25	1.12½@1.25	1.12½@1.25	.70	.50@.70
Average	1.30	1.00	1.16	1.15	1.19	**0.6668**	*0.4534*
Montreal	1.12½	.75	.70	.90	.75	.35	.25@.35

dlesex County will probably suggest a wage reduction; 20 per cent has been suggested.

Pittsburgh—The "Pittsburgh plan," which operated effectively last winter in this district, will be put into effect again this year. According to the plan, persons of means contribute funds for street, sewer and park improvements to be carried out by the unemployed; materials and supervision are provided by the city. Beginning with Dec. 1, emergency-work forces will be increased gradually from 1,000 to 4,000 by March. All city employees are to take two weeks' layoff without pay before Jan. 1, thus saving the city $300,000. The department of public works has arranged a schedule that will not conflict with regular activities of city departments.

Washington — The district commissioners have abandoned plans to put 400 workers on half time and to hire 400 additional employees. Welfare organizations assert that the cost of charitable administration would be doubled under the half-time system. Highway workers in the District of Columbia, numbering 600, will work 34 hours per week and receive pay for 38 hours.

Richmond—Adoption of the stagger system by the state highway department will mean employment for an additional 2,500 men. The entire road force will be shifted every two weeks.

Westchester County (New York)—County Building Trades Employers' Association has asked the unions to discuss possibilities of wage reductions for the new year. Employers will adhere to present schedules until a new agreement is signed.

New York—Unemployment has increased threefold in the last year and numbers 160,000 serious cases. Emergency Unemployment Relief Committee estimates the money needed double the 1930 fund of $9,000,000. City Affairs Committee estimates public-works projects authorized but on which no work has been started total $190,000,000. Fifteen thousand men now are doing emergency improvement work in parks, and it is expected that the emergency work committee soon will add another 15,000.

All building trades, except bricklayers, on 24 new school structures for Bronx borough, struck Nov. 15; in the other boroughs, cement finishers, ornamental iron workers and wire lathers were called out on eighteen school buildings in a sympathetic strike. The cause was alleged hiring of non-union laborers at sub-scale wages. Union officials have agreed to detail their charges so that the board of education may investigate and correct if necessary. Men returned to work Nov. 27.

Organized employers are pushing negotiations with all unions in the hope of signing contracts for 1932 at rates 25 per cent under the present scale. Helpers have been asked to accept as much as 30 per cent cuts. Decision of unions pending. On the Bankers Trust Co. annex now being erected in Wall St. the steel contractors have adopted a ten-hour day of two five-hour shifts, instead of one shift of eight hours. The organized contractors are endeavoring to secure adoption of the rotating employment plan wherever practicable throughout the entire construction industry.

Dallas—Electrical workers receive $8 per day, against the union scale of $11.

Dearborn—The committee on unemployment dissolved Nov. 16 under assurance from the Ford Motor Co. that gradual reemployment at the automobile plant will practically eliminate idleness this winter.

Minneapolis—Bond issues for emergency work other than that now under way have been postponed indefinitely because of insufficient funds. Flotations for direct public relief, however, are to proceed up to $753,000.

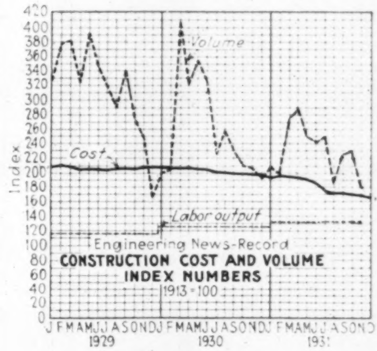
Davenport — Carpenters accepted wage reduction of 20c. per hour, to $1, at request of employers. Bricklayers, cement finishers, hoisting engineers and ironworkers are expected to do likewise.

Vallejo (Calif.)—Carpenters voluntarily accept wage cut of $2.25 per day, to $6.75. Six-hour day proposed.

Seattle—Dispute has arisen over wage rate to apply in relief employment on public improvements. Rates ranging from $1.50 to $4.50 per day have been recommended. The higher figure would greatly restrict the number benefited.

Construction Cost and Volume Index Numbers

The cost index number (166.23) for Dec. 1 is 1.7 per cent under that for Nov. 1 and 15.7 per cent below the index for Dec. 1, 1930. The December cost level is the lowest since May, 1922, at which time the index stood at 164.62. The November volume (180) is 21.4 per cent smaller than that for October and 13 per cent less than in November, 1930.



E.N.-R. Cost		**E.N.-R. Volume**	
Dec., 1931	**166.23**	**Nov., 1931**	**180**
Nov., 1931	169.28	Oct., 1931	229
Dec., 1930	196.86	Nov., 1930	207
1930 (Average)	202.85	1930 (Average)	260
1929 (Average)	207.02	1929 (Average)	317
1913 average	100.00		
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192
1931		1931	
January	194.48	January	208
February	196.61	February	198
March	194.51	March	278
April	191.63	April	289
May	189.33	May	251
June	187.23	June	243
July	174.37	July	248
August	171.38	August	187
September	171.40	September	225
October	169.78	October	229
November	169.28	November	180
December	166.23		

Capital and Contracts

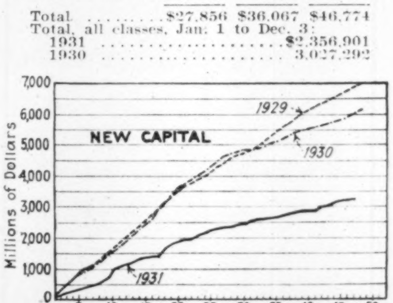
Issues of new capital for the week which ended Nov. 28 totaled $27,000,000, of which $16,000,000 went for public construction projects. The average weekly total of financing for November was $16,500,000, compared with $13,500,000 in October and $63,000,000 for November, 1930.

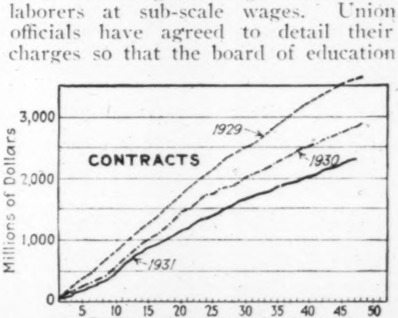
The principal issues of the week consisted of the following: Boston, Mass., 3¾s, $7,478,000, traffic tunnel, etc.; Yonkers, N. Y., 4½s, $1,860,000, water and public buildings; Minneapolis, Minn., 4½s, $1,828,320, municipal improvements.

Cumulatively, the total of construction bonds issued for the period Jan. 1 to Nov. 28, inclusive, amounts to $3,192,000,000, compared with $5,804,000,000 for the corresponding period in 1930. This week's contracts, with comparisons, are as follows:

(In Thousands of Dollars)

	Dec. 3.	Average of Last Four Weeks	
Buildings:	1931	1931	1930
Industrial	$2,325	$2,149	$5,342
Other	7,626	10,256	19,348
Streets and roads	6,010	4,969	8,135
Other construction	11,895	18,691	13,948
Total	$27,856	$36,067	$46,774
Total, all classes, Jan. 1 to Dec. 3:			
1931			$2,356,901
1930			3,027,292





Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type;** declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without including charge for four bags at 10c. each.* Cash discount not deducted. Prices are delivered by truck to contractors at site of job:

	Dec. 3, 1931	One Mo. Ago	One Yr. Ago
Atlanta	$2.25	$2.15	$3.00
Baltimore	*1.87*	1.90	2.60
Birmingham	2.40	2.40	2.60
Boston	*2.10*	2.20	2.35
Chicago	*1.67*	1.95	2.20
Cincinnati	1.60	1.60	2.94
Cleveland	1.25	1.25	2.80
Dallas	1.88	1.88	2.15
Denver	2.40	2.40	2.61
Detroit	1.90	1.90	2.60
Jersey City	1.79	1.79	2.33
Kansas City	2.00	2.00	2.07
Los Angeles	2.50	2.50	1.92
Minneapolis	2.15	2.15	2.50
Montreal	2.18	2.18	2.20
New Orleans	2.01	2.01	2.35
New York	1.60	1.60	2.10
Philadelphia	1.95	1.95	2.10
Pittsburgh	1.81	1.81	.....
St. Louis	1.85	1.85	2.15
San Francisco	2.44	2.44	2.64
Seattle	2.20	2.20	2.25

Current mill-prices per barrel to dealers, in carloads, without including charge for four cloth bags, f.o.b.:

Alpena, Mich	$1.20	Mason City, Ia.	$1.10
Buffington, Ind	1.10	Norfolk, Va.	1.61
Dallas, Tex.	1.74	Northampton, Pa.	1.21
Hannibal, Mo.	1.10	North Birmingham, Ala	1.31
Hudson, N. Y	1.21	Richard City, Tenn	1.31
Independence, Kan	1.10	Steelton, Minn	1.61
Ironton, Ohio	1.06	Universal, Pa.	1.21
Iola, Kan	1.10	Waco, Tex	1.60
La Salle, Ill.	1.10	Wyandotte, Mich	1.20
Limedale, Ind	1.10		

SAND AND GRAVEL—Per ton, delivered. Gravel, sizes ¾-in. or 1½-in.:

	Gravel	Sand
Atlanta	$3.00	**$2.25**
Baltimore	2.35@2.55	2.08
Birmingham, per cu yd., 2,600@2,800 lb	2.90	2.50
Boston	1.60@1.75	.90@1.15
Chicago, per cu.yd., 3,000 lb.	1.65	**1.65**
Cincinnati	1.50	1.25
Cleveland, per cu.yd., 3,000 lb	*2.00*	*2.00*
Dallas, per cu.yd., 2,750 lb	2.25	2.25
Denver, per cu.yd., 2,700 lb	1.80	1.35
Detroit	1.65	1.50
Kansas City	2.00	2.00
Los Angeles	2.20	1.50@1.70
Minneapolis, per cu.yd., 2,800 lb	1.70@2.40	1.00
Montreal	1.50	1.25
New Orleans, per cu.yd., 2,700 lb	2.02½	1.28
New York, per cu.yd., 2,800@3,000 lb.	2.78@3.15	2.15
Philadelphia	2.35@3.20	1.55@2.40
Pittsburgh	1.55	1.75
St. Louis	1.65	1.35
San Francisco	1.75	1.75
Seattle, per cu.yd., 2.900@3,000 lb	1.85	1.85

CRUSHED STONE—Per ton, sizes ¾-in. or 1½-in., limestone, delivered:

Atlanta	$3.00
Baltimore	2.60@2.80
Birmingham	*Slag used*
Boston	*1.80*@2.00
Chicago, per cu.yd., 2,500 lb	1.65
Cincinnati	2.25
Cleveland	*2.50*
Dallas, per cu.yd., 2,500 lb	2.90@3.00
Denver, granite, per cu.yd., 2,700 lb	2.50
Detroit	1.95
Kansas City	2.00
Los Angeles	2.20
Minneapolis, per cu.yd., 2,600 lb	2.40
Montreal	1.80@2.00
New York, per cu.yd., 2,800@3000 lb.	2.78@3.15
Philadelphia	2.30@3.15
Pittsburgh	3.25
St. Louis	1.65
San Francisco, trap rock	1.65
Seattle, per cuyd., 3,000 lb	3.00

CRUSHED SLAG—Prices for carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala.	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	2.25	.70
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.10	1.10	1.10	1.00
Youngstown District	1.25	1.35	2.00	1.25

CONCRETE BLOCKS—Standard, 8x8x16-in., hollow, delivered to job, each:

Birmingham (5x8x12)	$0.084	Kansas City	$0.18
Boston	.16@.20	Minneapolis	.10
Brooklyn and Queens	.12	New Orleans	.18
Cleveland	.16@.17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	20@.26
Detroit	.12	St. Louis	.14

HOLLOW TILE—Building tile per block, delivered to contractors in lots 2.000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x
Atlanta	$0.09	$0.12	$0.14	$0.18	$0.24
Baltimore	.105	....	.20	....	[illegible]
Birmingham	.089	.122	.167	.219	.25
Boston	.082	.118	.152	.21	[illegible]
Chicago	*.04865*	*.0669*	*.0912*	*.119*	*.1*
Cincinnati	.06815	.09485	.129	.165	.18
Cleveland	.048	.066	.09	.117	.13
Dallas	.081	.107	.141	....	.28
Denver	.0975	.135	.175	.2125	.25
Detroit	.08	.11	.145	.19	.21
Kansas City	.088	.11	.145	.19	.21
Los Angeles	.09425	.134	.188	.2325	.31
Minneapolis	.0611	.081	.10605	.1302	.17
New Orleans	.085	.115	.16	.225	.25
New York	.075	.125	.14	....	....
Perth Amboy, N. J.(f.o.b.)	.....	....	....	.2388	.295
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.041	.058	.0845	.111	.1227
St. Louis	.07	.098	*.12*	.17	.20
San Francisco	.0765	.105	.1765	....	....
Seattle	.085	.115	.18	....	....

BRICK—Prices delivered per thousand are as follows:

	Common	Front	Paving F.O.B. 3x8½x4-in.	Paving F.O.B. 3½x8½x4-In.
Atlanta	$13.00	$21.50	$32.00	$37.00
Baltimore	12.50	25.00@35.00	40.00	43.00
Birmingham	13.50	22.50	27.00	32.00
Boston	14.00	28.00	42.50	47.00
Chicago	12.00	......	42.00	43.00
Cincinnati	16.00	24.00	35.00	37.00
Cleveland	12.00@14.00	21.00@28.00	33.00	36.00
Dallas	12.00	17.50	......	35.00
Denver	9.00@10.00	25.00	......	......
Detroit	15.50	25.00	35.50	37.50
Kansas City	14.00	......	35.00	37.50
Los Angeles	9.00	26.50	......	......
Minneapolis	10.00	30.00	......	......
Montreal	28.00	......	......	......
New Orleans	13.00	......	40.00	45.00
New York	11.50	29.00	45.00	50.00
Philadelphia	16.00	......	40.00	45.00
Pittsburgh	12.00	22.00	41.00	58.00
St. Louis	14.00	22.00	35.00	35.00
San Francisco	14.00	......	45.00*	......
Seattle	14.00	......	48.50	61.00

*2½x8½x4-in.

LIME—Prices delivered to job:

	Hydrated, per Ton Finishing	Hydrated, per Ton Common	Lump, per Barrel Finishing	Lump, per Barrel Common
Atlanta	*$17.50*	**$15.00**	......	$2.50†
Baltimore	22.00	14.00	......	2.25†
Birmingham	30.00	17.50	......	2.00†
Boston	*21.50*	14.50	$4.00*	3.10*
Chicago	*13.00*	*13.00*	*1.50*†	1.50†
Cincinnati	13.05	10.70	......	......
Cleveland	12.00	10.00	2.50†	2.50†
Dallas	20.00	......	2.35†	......
Denver	30.00	23.75	3.80*	3.00†
Detroit	14.00	12.00	1.75†	1.65*
Kansas City	19.00	18.00	2.25†	2.00†
Los Angeles	26.00	18.00	2.00†	2.00†
Minneapolis	25.50	21.00	......	1.70†
Montreal	18.00	10.00	......	......
New Orleans	22.00	13.00	2.10†	1.95†
New York	17.00	14.00	4.10*	3.15*
Philadelphia	18.00	14.50	18.00‡	14.00‡
Pittsburgh	13.50	13.00	4.25*	2.75†
St. Louis	*18.00*	*16.00*	......	*12.50*‡
San Francisco	17.30	17.30	......	*1.57*†
Seattle, paper sacks	35.00	24.00	......	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

LIMESTONE—Mill blocks, f.o.b. siding, per cu.ft.:

New York: Rustic buff, $1.42; Standard gray, $1.47; Standard, $1.57; Selected gray, $1.57; Selected buff, $1.67.

Boston: Rustic buff, $1.45; Standard, $1.58; Selected buff, $1.71.

Pittsburgh: Rustic buff, $1.03; Standard, $1.18; Selected buff, $1.28.

SLATE—Roofing, f.o.b. quarry, Bangor, Pa., net, per square;

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@ 10.25
Medium Clear	8.00@ 10.50

Road and Paving Materials

PAVING STONE—Granite, lots of 50,000 blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	*105.00* per M.
Chicago, 5 in.	**3.90** per sq.yd.
Cincinnati	110.00 per M.
Cleveland	90.00@100.00 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	3.75 per sq.yd.
Minneapolis, 4½ in	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in.	120.00 per M.
Philadelphia	*105.00* per M.
St. Louis, 5 in.	3.30 per sq.yd

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	1.80@2.00
Kansas City	3½	16	2.09
Minneapolis	3½	16	2.50
Montreal	3½	16	2.63
New Orleans	3½	16	2.39
New York	3½	14	1.95
St. Louis	3½	16	2.10

FLAGGING—Alongside dock, New York, per sq.ft.:
Manhattan and Bronx, 4 ft. wide . . . $0.24 Queens, 5 ft. wide . . . $0.26

CURBING—Prices per lin.ft., f.o.b., cutting charges not included:
New York: Bluestone, f.o.b. barge, straight, 5x16-in., rough, 90c.
Birmingham: Granite, straight, 5x16-in., 50c.; 6x20-in., 60c.; roundings, 5x16-in., 65c.; 6x20-in., 80c.
St. Louis: Class "B" straight, 5x16-in., 75c.; roundings, $1.05@$1.30.

ASPHALT—Paving asphalt, f.o.b., per ton. Packages are 350-lb. bbls. or 425-lb. drums, in carload lots:

	Packages	Tank-car or -boat
Atlanta	$18.40	$15.40
Baltimore (f.o.b. refinery)	16.00	12.00
Birmingham (f.o.b. refinery)	.....	16.50
Boston	22.00	17.50
Chicago	22.50	18.50
Cincinnati	.....	12.00
Cleveland	18.75	15.50
Dallas	19.50	.....
Denver	30.00	.....
Detroit	16.68	12.43
Kansas City (f.o.b. refinery)	16.00	11.00
Los Angeles (f.o.b. refinery)	18.00	12.00
Maurer, N. J. (Bermudez)	......	25.00
Maurer, N. J. (Trinidad)	......	21.00
Minneapolis (f.o.b. Twin Cities)	23.10	18.10
Montreal	17.00	13.00
New Orleans	23.00	20.00
New York (f.o.b. refinery)	16.00	12.00
Philadelphia	16.00	12.00
Pittsburgh	24@26	14@18
St. Louis	**22.50**	**18.50**
San Francisco (f.o.b. refinery	18.00	12.00
Seattle	21.50	18.00

LIQUID ASPHALT—Residual, prices f.o.b., in tank cars, 8,000 gal. minimum, 45% asphalt, per gal.:

New York	$0.05
Birmingham	.06
St. Louis	.04
Dallas	.05

Iron and Steel

PIG IRON—Furnace, per gross ton:

Birmingham, No. 2 fdry., silicon, 1.75@2.25	$11.00
Pittsburgh, basic	15.50

STRUCTURAL STEEL—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill. Beams and channels, 3 to 15 in; angles 3 to 6-in., ¼-in. thick; tees, 3-in. and larger; and plates, ¼-in. thick and heavier:

Birmingham	$1.70	New York	$2.35
Chicago	3.00	Pittsburgh	1.60
Cleveland	2.95	St. Louis	3.25
Dallas	3.50	San Francisco	2.90

BARS, CONCRETE REINFORCING—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill, on bars rolled from billets, size ¾-in.:

Birmingham	$1.75	New York	$2.35
Chicago	*1.65*	Pittsburgh	1.60
Cleveland	1.75	St. Louis	3.00@3.15
Dallas	▼2.75	San Francisco	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San-Francisco
2.2	$11.00	$17.50	$10.60	$16.00	$18.00	$21.50
2.5	12.00	18.50	11.40	17.00	19.50	22.50
3.0	*13.00*	20.50	12.65	18.50		25.00
3.4	*14.00*	22.00	**13.65**	19.25	24.00	27.00

WIRE REINFORCEMENT FOR CONCRETE—Plain, per 100 sq.ft., 4 in. x 4 in. triangle mesh. Manufacturers' quotations are in carloads at mills; dealers' are delivered in lots of 10,000 sq.ft. or over:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Del. From Warehouse			
				New York	St. Louis	Dallas	San Francisco
032	22	$0.89	$0.91	**$1.21**	$1.30	$1.63	$1.22*
049	28	1.13	1.16	**1.55**	1.70	2.00	1.55*
068	35	1.39	1.42	**1.80**	2.10	2.25	1.91*
093	45	1.78	1.83	**2.31**	2.65	2.86	2.46*
126	57	2.20	2.26	**2.85**	3.30	3.52	3.03*
153	68	2.63	2.69	**3.41**	3.95	4.20	.....
180	78	3.01	3.09	**3.92**	4.35	4.80	.....

* F.o.b.

STEEL SHEETS—Prices per 100 lb. for base sizes, delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

	Blue Annealed No. 10	Black No. 24	Galvanized No. 24
Chicago	$3.29	$3.55	$4.10
Cleveland	3.00	3.60	4.00
New York	2.65	3.50	4.00
Pittsburgh	1.85	2.40	2.90
St. Louis	3.45	3.80	4.35
San Francisco		4.15	4.65

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River:

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas.

Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Structural rivets, round head, ¾-in., full kegs, per 100 lb., delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

Chicago	$3.75
Dallas	5.00
Denver	4.65
New York	4.00
Pittsburgh	[illegible]
St. Louis	4.00
San Francisco	5.50
Seattle	4.50

STEEL SHEETPILING—Base price, f.o.b., Pittsburgh, for large mill lots, per 100 lb. . . . $1.90

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:
Per package . . . $9.50

SHIP SPIKES—Per 100 lb., black, from warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	¼-In.	⅜-In.	½-In.
San Francisco	$5.50	$5.05	$4.90
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $2.90 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$1.95@$2.00	$2.40	$3.30	$2.40	$3.50	$2.75	$4.95

SCRAP—The prices following are f.o.b., per gross ton, paid by dealers:

	New York	Chicago	Detroit
No. 1 railroad wrought	$5.00	$6.50	....
Stove plate	3.50@4.75	6.25	$4.75
No. 1 machinery cast	8.50†	8.50	8.50*
Machine shop turnings	2.00	4.00	[illegible]
Cast borings	2.50	4.00	5.00
Railroad malleable	6.00	7.00	....
Re-rolling rails	6.00	10.00	9.00
Heavy melting steel, No. 1	4.50	7.75	**7.00**
Iron and steel pipe	5.50	4.50	....

*Net ton. †Delivered direct to foundries.

FREIGHT RATES—The following freight rates per 100 lb., effective May 20, 1930, apply on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc.:

Atlanta	$0.58*	Detroit	$0.265†
Baltimore	.27†	Kansas City	.695†
Birmingham	.58*	New Orleans	.67*
Boston	.40†	New York	.33†
Buffalo	.235†	Pacific Coast (all rail	1.15‡
Chicago	.34†	Philadelphia	.29†
Cincinnati	.265†	St. Louis	.39†
Cleveland	.185†	St. Paul	.60*
Denver	1.15‡		

*36,000 lb. †40,000 lb. ‡60,000 lb.

Railway Materials and Supplies

STEEL RAILS—Per gross ton, f.o.b.;

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	33.00	34.00
Re-rolled rails	24.00@28.00	.....	32.00

RAILWAY TIES—Prices f.o.b., per tie, for carload lots:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.00	$1.20
	Dense yellow pine, untreated	.80	1.00
Birmingham	White oak, untreated	.90	1.05
	White oak, creosoted	1.45	1.55
	Southern pine, untreated	.45	.95
	Southern pine, creosoted	1.05	1.40
Chicago	White oak, untreated	1.05	**1.35**
	Oak, empty cell, creosoted	1.40	**1.80**
	Oak, zinc treated	*1.25*	*1.65*
	Southern pine, creosoted	*1.25*	*1.60*
St. Louis	White oak, untreated	.85	1.30
	Red oak, untreated	.80	1.20
	Red oak, creosoted	1.20	1.70
	Sap pine or cypress, untreated	.75	1.10
San Francisco	Douglas fir, green, untreated	.50	.68
	Douglas fir, empty cell, creosoted	*1.22*	*1.64*
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Prices per 100 lb., f.o.b., for large mill lots at Pittsburgh and Birmingham, together with warehouse prices at other places named:

	Pittsburgh	Birmingham	Chicago	St. Louis	San Francisco
Standard spikes, 9/16-in. and larger	$2.70	$2.70	$3.45	$3.65	$4.10
Track bolts	3.80	3.70	4.30	4.50	5.10
Standard section angle bars, splice bars or fish plates	2.75	3.00*	5.75	.....	.....
Tie plates	1.95	2.07½	1.95†	.....	.....

*At warehouse. †At mill.

Pipe

WROUGHT STEEL PIPE—Discounts from standard lists for delivery from warehouse, except at Pittsburgh, where prices are f.o.b. mill:

	1 to 3-In. Butt Weld Black	1 to 3-In. Butt Weld Galvanized	3½ to 6-In. Lap Weld Black	3½ to 6-In. Lap Weld Galvanized
Chicago	**57.25%**	**44.71%**	**53.83%**	**41.29%**
Cleveland	53.3%	42.3%	50.8%	37.8%
New York	56.14%	43.6%	52.72%	40.18%
Pittsburgh	64%	52.5%	61%	49.5%
St. Louis	51%	38%	48%	35%

CAST-IRON PIPE—Prices per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots (250 tons and under) of pipe:

	4-In.	6-In. and Over
Birmingham mill	$35.00@$36.00	$32.00@$33.00
Burlington (N. J.) mill	35.00@ 36.00	32.00@ 33.00
Chicago	43.00@ 44.00	40.00@ 41.00
New York	38.00	35.00
Pittsburgh	43.50@ 44.50	40.50@ 41.50
St. Louis	42.80	39.80
San Francisco	45.00@ 46.00	42.00@ 43.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In.
Atlanta	$0.105	$0.175	$0.315	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.135	.225	.405	$0.85	1.625	$3.18	4.38
Boston	.18	.28	.55	1.35	2.38	3.95	5.90
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.05	1.89	3.456	5.4325
Cleveland	.1125	.175	.3375	.825	1.485	4.824	7.38
Dallas	.23	.325	.586	1.106	1.95	3.68	5.00
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	.....
Kansas City	.21	.335	.52	1.22	1.90	3.60	.....
Los Angeles	.217	.2825	.4985	1.1865	2.034	3.93	9.00
Minneapolis	.155	.24	.50	1.15	1.85	3.45	4.60
Montreal	.30	.45	.75	1.95	2.60	.....	7.20
New Orleans	.17	.28	.52	1.00	1.90	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.0945	.147	.297	.80	1.44	2.304	3.28
Pittsburgh	.1575	.245	.54	1.25	2.25	4.68	7.17
St. Louis	.1295	.235	**.423**	1.05	1.80	3.20	4.40
San Francisco	.21	.30	.54	1.26	2.16	3.60	5.40
Seattle	.22	.30	.54	1.26	2.16	2.50	5.50

CLAY DRAIN TILE—Prices delivered per 1,000 lin.-ft.:

Size, In.	New York	Birm'ham	Pittsburgh	Chicago	St. Louis	San Fran.	Seattle
4	$42.00*	$50.00	$80.00	$40.00	$50.00	$67.50	$60.00
6	*75.00**	85.00	110.00	100.00	85.00	112.50	112.00

*F.o.b.

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... **$0.084** Chicago.... **$0.092** Minneapolis... **$0.092**

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.25; White in oil, $13.25; Red, dry, $13.25; Red, in oil, $14.75.

CHEMICALS—Water, sewage treatment, road work, f.o.b., carlots, New York:

Sulphate of aluminum, in bags, per 100 lb	$1.25
Sulphate of copper, in bbl., per 100 lb	3.40
Soda ash, 58%, in bags, per 100 lb	1.15@1.17½
Chlorine, cylinders, per lb	.04
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: 5-in.,-7-ft., 6-in.; ¾-in.,-6-ft., 1-in.; ⅞-in.,-4-ft., 5-in.; 1-in.,-3-ft., 8-in.; 1¼-in.-2-ft., 5-in.; 1½-in.,-1-ft., 8-in. Following prices are quoted by dealers per pound for ¾-in. and larger:

Atlanta	*$0.19*	Kansas City	$0.23
Baltimore	.225	Los Angeles	.175
Birmingham	.25	Minneapolis	*.18*
Boston	.20	Montreal	.185
Chicago	.165	New Orleans	.20
Cincinnati	.21	New York	.17
Cleveland	.21	Philadelphia	.21
Dallas	.285	St. Louis	17@.175
Denver	.20	San Francisco	.175
Detroit	.185	Seattle	.175

BUILDING PAPER—Black, 50-lb. per roll of 500 sq.ft., in carloads, f.o.b., producing point.... $2.16

SLATERS FELT—In carloads, per roll, f.o.b., producing point.... $0.79

ROOFING MATERIALS—Prices, f.o.b. New York, delivered to contractors, in carloads:

Asphalt felt, per 100 lb	$2.50
Tar felt, per 100 lb	2.50
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFING—Prices, delivered to contractors, in carloads, f.o New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.50
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.25
Slate surfaced roofing in rolls weighing 85 to 90 lbs.	2.50

WINDOW GLASS—Discounts from latest jobbers' window-glass list, dated Sept. 15, 1928, at New York warehouse:

	Single Thickness A Quality	Single Thickness B Quality	Double Thickness A Quality	Double Thickness B Quality
First 3 brackets	89%	91%	88%	90%
Larger sizes	88%	90%	88%	90%

EXPLOSIVES—Price per pound for dynamite delivered:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles	$0.1725	$0.1925
Baltimore	.215	.2375	Minneapolis	.20	.225
Birmingham	.135	.157	Montreal	.20	.24
Boston	.225	.25	New Orleans	.195	.22
Chicago	*.17*	*.195*	New York	.245	.2675
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	.234	.272	St. Louis	.1975	.2175
Denver	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

Lumber

Prices Are Delivered, Per M Ft., B. M., No. 1 Common, Rough

New York—Timbers, to contractors, at site of job in Manhattan, in 20ft. lengths and under:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$45.00	$29.00
3x10 to 10x10	52.00	30.00
3x12 to 12x12	63.00	31.00
3x14 to 14x14	70.00	35.00

Chicago—Timbers, pine, in 20 ft. lengths and under; fir, up to 32 ft:

	Long-Leaf Yellow Pine	Douglas Fir
3x4 to 8x8	*$42.50*	*$42.50*
3x10 to 10x10	*49.50*	*44.50*
3x12 to 12x12	*62.50*	*44.52*
3x14 to 14x14	*72.51*	*45.50*

San Francisco—Douglas fir timbers:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$35.00	$37.00
3x6 and 8	35.00	37.00
3x10 and 12	35.00	37.00
3x14	38.00	39.00

Other Cities—Timbers, boards, etc.:

	8x8-In. x 20 Ft. and Under Pine	Fir	Hemlock	Spruce	3x12 to 12x12-In. 20 Ft. and Under Pine	Fir
Atlanta	*$40.00*	......	......	......	*$55.00*	......
Baltimore	*35.00*	*$48.00*	*$52.00*	*$58.50*	*72.00*	*$48.00*
Birmingham	46.00	......	......	......	76.00	......
Boston	51.00	46.00	*46.50*	48.50	57.00	43.00
Cincinnati	42.50	55.00	......	......	52.50	52.50
Cleveland	54.00	54.00	......	......	52.00	52.00
Dallas	55.00	55.00	55.00	55.00	55.00	57.50
Denver	......	55.00	55.00	......	......	55.00
Detroit	53.00	51.00	......	......	65.00	51.00
Kansas City	35.00	35.00	35.00	......	55.00	40.00
Los Angeles	......	41.50	......	......	......	42.50
Minneapolis	......	46.25	......	......	......	46.25@47.75
Montreal	......	......	......	40.00	40.00	......
New Orleans	38.00	38.00	......	43.00	65.00	58.00
Philadelphia	45.00	42.00	36.00	40.00	55.00	40.00
Pittsburgh	53.00	57.00	65.00	66.00	43@57	57@60
St. Louis	41.00	38.00	39.00	......	54.00	39.00
Seattle	......	16.00	......	......	......	15.00

	1x10 In. x 16 Ft. and Under Pine	Fir	Hemlock	2x10 In. x 16 Ft. T. & Gr. Pine	Fir
Atlanta	*$50.00*	......	......	*$35.00*	......
Baltimore	*52.00*	*$43.00*	*$42.00*	......	......
Birmingham	40.00	......	......	55.00	......
Boston	46.00	41.00	*41.50*	*47.00*	$45.00
Cincinnati	45.00	47.50	......	35.00	45.00
Cleveland	*44.00*	*37.00*	*37.00*	42.00	54.00
Dallas	60.00	......	......	55.00	......
Denver	......	36.00	36.00	......	45.00
Detroit	49.50	45.00	......	43.00	43.00
Kansas City	40.00	40.00	......	35.00	33.00
Los Angeles	41.50	41.50	......	......	48.50
Minneapolis	65.00*	40.00	......	45.00*	39.00
Montreal	45.00	50.00	40.00	......	55.00
New Orleans	45.00	50.00	......	54.00	48.00
Philadelphia	48.00	40.00	35.00	49.00	40.00
Pittsburgh	40.00	47.00	55.00	40.00	50.00
St. Louis	*38.00*	39.00	39.00	41.00	40.00
Seattle	......	15.00	......	......	16.00

*Northern Pine, No. 2 Com.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1¾ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	*$0.10*	$0.165
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	*.145*	.215
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	*.17*	.235
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	*.205*	.345
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	*.2225*	.295
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	*.285*	.395
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	*.325*	.435

CONSTRUCTION NEWS

CONTENTS

Engineering Structures: Page
Airports 204
Bond elections 203
Bridges 201a
Dams 204
Equipment 205
Excavation 203
Federal Government 203
Foreign 206
Grade Crossings 204
Heating and Ventilating 205
Materials 205
Parks and Sports 205
Piers and Wharves 204
Power and Lighting 204
Railways 204
Sewers 201
Streets and Roads 202
Subways and Terminals 204
Waste Disposal 201a
Waterworks 201
Unclassified 205

Industrial Buildings:
Factories and Mills 208
Garages 208
Power Plants 208
Warehouses 208

Commercial Buildings:
Banks 207
Churches 206
Clubs 206
Hospital 206
Offices 207
Public 207
Residential 206
Schools 206
Stores 207
Theaters 207
Unclassified 207

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	*Project*	*Cost*	*Status*
Sewers			
Brooklyn, N. Y.	Sewage disposal system	$4,000,000	Proposed
Excavation and Dredging			
Jamestown, Pa.	Clearing swamp land, etc	1,150,000	Proposed
Subway			
New York	Subways	75,900,000	Proposed
Unclassified			
Quincy (Mass.)	Oil terminal	2,000,000	Contract
Revere (Mass.)	Oil terminal	3,000,000	Proposed
Texas and Louisiana	Pipe line	10,000,000	Proposed
Federal Government			
Hot Springs (Ark.)	Hospital	1,500,000	Proposed
Des Moines (Ia.)	Hospital	1,300,000	Proposed
Batavia (N. Y.)	Hospital	1,000,000	Proposed
Baltimore	Appraisers stores	1,000,000	Proposed
Factories and Mills			
Los Angeles	Factory and distributing unit	2,000,000	Proposed
Meraux (La.)	Refinery	1,000,000	Day labor and separate contracts
Power Plant			
Hull (Que.)	Power units	5,000,000	Proposed
Buildings			
Jersey City	Medical center	5,000,000	Proposed.
Toronto (Ont.)	Office	1,500,000	Bids asked
Grand Rapids	Civic auditorium	1,000,000	Proposed
St. Louis	Municipal auditorium and soldiers memorial	5,000,000	Proposed
New York	Municipal building annex	5,000,000	Bids asked
Waterville (Me.)	College group	3,000,000	Proposed
Jersey City	Senior high school	2,000,000	Proposed
New York	College	4,500,000	Proposed
Oberlin (Ohio)	College	1,300,000	Proposed
Scranton (Pa.)	School	1,500,000	Proposed
Philadelphia	Philosophical	2,500,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Santa Cruz—For 18,000 ft. pipe line in Soquel Dist. in connection with municipal waterworks. R. Fowler, city engr.

Ia., Hughes—Hughes Waterworks & Sewer Impvt. Dist. 1. preliminary plans waterworks, distribution system, sanitary sewers. $80,000. T. H. Allen Co., 65 McCall Bldg., Memphis, Tenn., engrs.

Ia., Newton—City Council new filtration plant. $55,000. L. Higgins, 211 Continental Bldg., Des Moines, engr.

Ia., Perry—City Council new filtration plant. W. R. South, city clk.

Mass., Scituate—Town. Bd. Selectmen, additions, improvements to waterworks. $100,000 or more. Metcalfe & Eddy, Statler Bldg., Boston, engrs. Noted Nov. 12.

N. Y., New Castle—Town water line extensions. $25,000. C. H. Sells, Pleasantville, engr.

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., bids in May or later, pumping plants, equipment, on Rondout Creek. $800,000. Noted Apr. 30.

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., bids in May or later pumping plant, equipment for Walkill River. $800,000.

O., East Cleveland—Steel plate water storage tank, $25,000. M. Garnett, City Hall, engr.

Pa., Spring Grove—Boro granted permit 20 m.g. dam across Codorus Creek.

Wash., Marysville—City applied to State Div. of Hydraulics for permission to construct municipal waterworks. $100,000.

Que., Chicoutimi—Town Council soon takes bids waterworks addition. $189,000.

Que., Joliette—City Engineer soon takes bids cistern system. $101,250.

BIDS ASKED

Calif., San Francisco—Dec. 11, by S. J. Hester, secy. Bd. P. Wks., City Hall, furnishing, delivering power transformers, centrifugal pumps, synchronous motors, in connection with Corral Hollow Pipe Line.

Mass., Boston—See "Streets and Roads."

N. Y., Long Island City—Dec. 8, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Hammels Blvd., 149th Pl., 53rd, 34th, East Hampton and Beach Channel Rds., Concord, Sanborn and 65th Aves., 46th, 50th, Palmetto, 60th, 164th, 215th, 268th and Beach 64th Sts.

N. Y., New York—Dec. 8, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Fort Washington Ave and in Fort Tryon Park.

Pa., Lancaster—Dec. 15, by T. W. Metzger, mayor, 3rd unit $3,500,000, water system and sewage disposal plant, incl. 4 mi. 24- to 84-in. sewers. $200,000. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs.; adv. E. N.-R. Dec. 3.

CONTRACTS AWARDED

Mo., St. Louis—Bd. P. Serv., City Hall, installing and wiring switchboard for generators at City Sanitary Pumping Station, to Briner Electric Co., 1015 Morgan St., $2,488; concrete found. for generators at City Sanitarium Pumping Station, to J. J. Gilmore, 844 Rush St., Chicago, Ill., $855; concrete, brick scale house at Howard Bend Water Dpt., to W. C. Harting Constr. Co., International Life Bldg., $2,695; plumbing for City Jail to H. H. Schlapprizzi Plumbing Co., 5409 Grace Ave., $4,994. Grand total $11,032.

Utah, Salt Lake City—City Comn., 10,820 ft. 12- to 18-in. c.i. mains in 5th South St., to J. J. Burke & Co., Kearns Bldg., $53,247. Est. $70,000.

Wash., Port Angeles — J. H. Coyne, contractor, Port Angeles, 4- to 8-in. wood pipe for Olympic water system, to Federal Pipe & Tank Co., 5332 24th St., Seattle, $18,000. Est. $18,500.

Ont., Belleville—City, furnishing c.i. pipe for pipe line from filtration plant to city, to National Iron Corp. Ltd., Cherry St., Toronto, $22,013. Noted Nov. 26.

SEWERS

PROPOSED WORK

Conn., Greenwich—Storm sewer drain in Mason St. $50,000 bonds voted for same. Maturity about Jan. 1.

Ind., Terra Haute—Enlarging sewerage system. $691,750. W. Posey, Terra Haute, mayor.

Ia., Hughes—See "Waterworks."

N. J., Essex Falls—Bd. Boro Council, Boro Hall, municipal sewage disposal system. $25,000.

N. J., South River — Private Corporation, sewage disposal plant. City. Mayor Allgar, in charge, lessee. Engineer not appointed. Noted Nov. 26.

N. Y. Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, plans in progress sewage disposal system, at Paerdegat Basin, for Dept. Sanitation. $4,000,000. **Maturity soon.**

O., Cleveland — City Council start plans soon, bids in spring (2nd unit) Easterly Sewage Treatment plant, rein.-con. sludge digesters, drying tanks, part of $14,000,000 plant. G. B. Gascoigne, Leader Bldg., consult. engrs. Noted Feb. 19.

Pa., Cleveland—See "Power Plants."

Tex., Dallas—City, c/o E. Goforth, secy., bids in 1932, 1 story, basement, 44 x 74 ft. pump and blower station; 34 x 54 ft. screen houses; 20 x 20 ft. pumping station; 41 x 54 ft. administration building and laboratory; equipment, incl. 2 detritors, 36 ft. sq. 14 ft. deep; 2 primary clarifiers, 100 ft. square, 14 ft. deep; 235 x 500 ft. aeration tanks, 16 ft. deep; 5 final clarifiers, 105 ft. diam., 14 ft. deep; 4 digestor tanks, 85 ft. diam., 30 ft. deep, 6 air compressors. $1,700,000 voted. Noted Aug. 6. Howley, Freese & Nichols, Copps Bldg., Fort Worth, engr.

Ont., Thorold—Town Council sewers, $75,000.

Ont., Welland—City Council sewers, $100,000.

BIDS ASKED

New York—Dec. 18, by Westchester Co. Park Comn., Court House, White Plains, 66- to 72-in. rein.-con. sewer Sect. L, Sawmill Project, Greenburgh; 4,600 ft. 48 in. rein.-con. sewer Sect. R, Mamaroneck Project, Mamaroneck; 1,000 ft. 60 in. c.i. submarine outlet sewer Sect. D, Sawmill, North and Central Yonkers Project, and 5,400 lin.ft. Sect. P, Sawmill Project, both Yonkers. To exceed $200,000. W. W. Young, White Plains, co. engr.

N. Y., Brooklyn—Dec. 9, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Mansfield Pl. and Horace Court.

N. Y., Long Island City—Dec. 7, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 45th Rd., Polo and Wren Pls., Farmers and Foch Blvds., 33rd, 41st, 71st, 48th, 107th, Archer and Dix Aves., Union Hall, Albert, Spirtz, 190th, 207th; 245th, 88th Sts.

N. Y., New York—Dec. 9, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Ave., sewers in Boston Rd., Magenta St., Paulding Ave.

N. Y., Poughkeepsie—Dec. 23, by Dpt. Mental Hygiene, State Office Bldg., Albany, glass enclosure for sludge clarifier in connection with sewage disposal system, Hudson River State Hospital. F. W. Parsons, comr.; adv. E.N.-R. Dec. 3.

O., Canton—Bd. Control bids about Feb. 11, sanitary trunk sewer from west side interceptor along Pennsylvania right-of-way to Smith Ave. S.W. $30,900. W. E. Sarver, City Hall, engr.

O., Maple Heights—Dec. 7, by City, 3,400 ft. 12 in. and 3,400 ft. 42- to 60-in. brick tile sewer, Center Rd. Outlet 3. $45,000. C. W. Courtney, East 11th St. and Walnut Ave., Cleveland, engr.

R. I., Bristol—Dec. 10, by Bristol Sewer Comn., at office. H. R. Barrows, engr., 241 Thames St. and 6 Beacon St., Boston, Mass., 2,740 ft. 18 in., 1,750 ft. 21 in. and 980 ft. 24 in. interceptor, and 450 ft. 10 in. and 1,320 ft. 14 in. c.i. force mains, in Hope, Oliver and Constitution Sts. $25,000 or more. Noted Oct. 29.

Wis., Superior—See "Contracts Awarded."

Ont., Hamilton—See "Contracts Awarded."

See proposal advertising on page 77

LEADITE

Trade Mark Registered U.S. Pat. Office

8-in. c.i. bell and spigot extension main in street widening project - - - - - - - - - - *all joints made with* LEADITE

One of the many cases where LEADITE has been used for jointing c. i. bell and spigot water mains under well paved streets with heavy traffic. Such water lines MUST be laid with tight, DEPENDABLE joints, otherwise leaky joints might develop, and the expense of digging-up the streets would be necessary, not to mention the re-routing of traffic and inconvenience to water users from the temporary lack of service.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

100 LBS.
LEADITE
REG. U.S. PAT. OFF.
CEMENT
FOR JOINTING WATER MAINS
MANUFACTURED BY
THE LEADITE COMPANY
PHILADELPHIA, PA.

No Caulking

Sewers (Continued)

Ont., Oshawa—See "Contracts Awarded."

Ont., Sudbury—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Long Beach—City Council, 314,746 lin.ft. sewer, structures, pumping station in North Long Beach Sewer Dist. 11, to Gogo & Rados, 10024 Figueroa St., Los Angeles, $724,863. Noted Oct. 22.

Calif., Los Angeles—See "Streets and Roads."

Kan., Salina—C. E. Banker, city clk., Sewer Constr. Job. 61, incl. 25,256 ft. 12- to 60-in. concrete pipe, 80 ft. 12 in. corrugated metal pipe, 14,925 ft. trenching, 64 manholes, 130 street inlets, 2,283 sq.yd. paving, to H. J. Taylor Constr. Co., Salina, $97,471.

Md., Baltimore—Bd. Awards, Sewers, Sanitary Contr. 287, to N. Martell, 4517 Pimlico Rd., $19,049.

Mass., Boston—Commonwealth of Massachusetts, Metropolitan Dist. Comm., 20 Somerset St., section New Neponset Valley Sewer, Canton, to T. J. O'Connell, 75 Claymore Rd., Brighton, $44,000.

Mich., Flint—For 2 mi. concrete, vitr. clay sewer extensions, brick and concrete manholes, to R. D. Baker Co., Royal Oak, $93,189.

O., Cleveland—American Constr. Co. (general contractors), 1276 West 3rd St., have awarded sub-contract for 1 story 18 x 1,050 ft. and 40 x 60 ft. galleries and pumping plant for Easterly Sewage Treatment Plant, East 140th St., for City, to Dawson & Finan, 1276 West 3rd St. Noted Nov. 12, under "Contracts Awarded."

O., Garfield Heights (br. Cleveland)—Sewer in Dists. 3, 4, 5 and 7, to D. Rossi-Marceletti Co., 11700 Willard Ave., $44,535.

O., Rocky River—Sewage treatment plant, Lake Rd., to Industrial Constr. Co., 308 Euclid Ave., Cleveland, $90,000. Noted Nov. 12.

Pa., Meadville—City, at office G. S. Maxwell, clk., sewage disposal plant, filter type, incl. sewage pumping station, force main sewage treatment plant, appurtenances, to Keystone Constr. Co., Race St., $123,347. Est. $150,000. Noted Oct. 29.

Utah, Salt Lake City—City Comn., 5,444 lin.ft. sewers, to Mullins & Wheeler, Salt Lake City, $11,321; 4,880 lin.ft. 12- to 30-in. vitr. tile storm sewers, Storm Sewer Unit 13th East from Harvard Ave. to Emigration Creek, to J. J. Burke, Kearns Bldg. and Pickering Bros., 460 South 7th St. E., $24,041; 2,419 ft. 24- to 36-in. concrete sewers in 13th St. east from 21st St. south to Parleys Creek, to Young & Ogden, Richfield, $8,264. Grand total $43,626. Noted Nov. 12.

Wis., Superior—For 5,552 ft. 42- to 84-in. monolithic rein.-con. sewer and 370 ft. 36 in. vitr. sewer, day labor. $130,000. E. B. Banks, city engr.

Ont., Hamilton—City Council, 8 in. and larger storm and sanitary sewers in Ainslee Ave., Hill View and Emerson Aves., day labor, under supervision W. L. McFaul, engr., City Hall. $40,080.

Ont., Oshawa—Vitr. tile or concrete sewers in Bloor St., day labor. $70,000. F. B. Goedike, City Offices, engr. Noted Sept. 24.

Ont., Sudbury—City Council, 8 in. and larger vitr. tile storm sewers in Notre Dame St., day labor. $34,837. W. McMullen, Mackie Bldg., engr.

WASTE DISPOSAL

BIDS ASKED

Ore., Portland—Bids about Dec. 23, refuse incinerator. $150,000. O. Laurgard, city engr.

R. I., Providence—Dec. 21, by Bd. Contr. & Supply, two 100 ton incinerator units, incl. concrete founds., for City, City Clerk, City Hall.

BRIDGES

PROPOSED WORK

D. C., Wash.—Washington City Plan and Dpt. P. Wks. sponsoring construction several bridges to connect Analostan Island with mainland as part of Potomac River Parkway System. To exceed $25,000.

O., Cleveland—Cuyahoga Co. bids in spring rein.-con. bridge over Rocky River Valley. $800,000. A. M. Felgate, Court House, engr.

Pa., Jamestown—See "Excavation, Dredging, Irrigation, Levees and Harbors."

BIDS ASKED

California—Dec. 9, at office C. H. Purcell, engr. State Hy. Comn., Sacramento, 40 ft. span rein.-con. bridge on concrete abutments with wing walls over Berros Creek, east of Los Berros; six 38 ft. span rein.-con. bridge on concrete bents and concrete abutment with wing walls on pile founds. over Arroyo Grande Creek at Arroyo Grande, both San Luis Obispo Co.

Ill., Urbana—Dec. 2, by Bd. Supervs. Champaign Co., one 50 ft., one 40 ft. span rein.-con. deck girder bridges, Sect. 84B-M.F.T.—widening roadway on 60 ft. steel truss bridge, Sect. 86B-15d—two 12 x 10 ft., two 8 x 8 ft., and three 6 x 10 ft. rein.-con. box culverts, Sect. 90B-15d. G. H. Baker, c/o State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, engr. co. roads.

Iowa—Dec. 8, by State Hy. Comn., Ames, three 50 x 24 ft. span I-beam bridge, Rd. 187 north of Lamont, B-744, Buchanan Co.—one 130 x 20 ft. high truss bridge with two 40 x 20 ft. I-beam approaches, one 24 x 24 ft. I-beam bridge, 43 culverts, extensions, Rd. 25 north of Guthrie Center, B-647, Guthrie Co.—three 140 x 20 ft. high truss bridges with two 40 x 20 ft. I-beam approaches, one 40 x 24 ft. I-beam bridge, 4 culverts, Rd. 169 south of Algona, B-731, Kossuth Co., B. Johnson, chn.

Massachusetts—C. Bianchi, Framingham, general contractor, taking bids rein.-con., bridge over Neponset River, in Sharon, Walpole and Norwood for Dpt. P. Wks., Boston. $25,000 or more. Noted Nov. 5, under "Streets and Roads, Contracts Awarded."

Michigan—Dec. 8, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, MBr. 1 of 8-14-11, Contrs. 2 and 3, two 75 ft. spans, 2 rein.-con. abutments, steel deck girder, rein.-con. flooring, concrete wearing surface, 40 ft. roadway, two 2½ ft. sidewalks, Barry and Kent Counties, for State Hy. Comn., Lansing.

Michigan—Dec. 8, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, M.Br. 1 of 78-2-20, Contrs. 2 and 3, three 33 ft. spans, remodeling 2 masonry abutments, steel deck girder, with rolled beams, rein.-con. flooring, 30 ft. roadway, two 5 ft. sidewalks, St. Joseph Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by H. G. Oakes, div. engr., Plymouth, MBr. 1 of 81-14-22, Contrs. 2 and 3, one 75 ft. span, 2 rein.-con. abutments, counterfort type, steel deck girder, rein.-con. flooring, 40 ft. roadway, two 6 ft. sidewalks, Washtenaw Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by H. G. Oakes, div. engr., Plymouth, MBr. 1 of 46-11-18C-2 and 3 and MO46-19C-3, one 55 ft. span, 2 rein.-con. abutments, steel deck girder with rein.-con. flooring, one 2½ ft. sidewalk, one 6 ft. sidewalk, grading, shaping, drainage, concrete paving 0.161 mi. Lenawee Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by H. G. Oakes, div. engr., Plymouth, FBr. 1 of 58-1-1 Contrs. 3 and 4, one 35 ft. span, 2 rein.-con. abutments, semi-gravity type, steel deck girder rein.-con. flooring, 40 ft. roadway, two 2½ ft. sidewalks, Monroe Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by H. G. Oakes, div. engr., Plymouth, FBr. 2 of 58-1-1 Contrs. 3 and 4, two 45 ft. spans, widening 2 rein.-con. semi-gravity type abutments, steel deck girder, rein.-con. flooring, 40 ft. roadway, two 2½ ft. sidewalks, Monroe Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by J. T. Sharpensteen, div. engr., Escanaba, Federal Aid Bridge 2 of 21-8-21, Contrs. 2 and 3, Federal Aid 126 B, Contrs. 2 and 3, three 60 ft. spans, 2 rein.-con. abutments, semi-gravity type, rein.-con. piers, steel deck girder type rolled beams, rein.-con. floor, concrete wearing surface, 30 ft. roadway, to 2½ ft. sidewalks, Delta Co., for State Hy. Comn., Lansing.

Michigan—Dec. 10, by H. W. Hagaman, div. engr., Flint, State Reward Br. 1 of 25-11-21, Contrs. 2 and 3, three 65 ft. spans, 2 rein.-con. abutments, counterfort type, steel deck girder superstructure, rein.-con. flooring, concrete wearing surface, 30 ft. roadway, two 2½ ft. sidewalks, Genesee Co., for State Hy. Comn., Lansing.

New York—Dec. 29, by Dpt. P. Wks., F. S. Greene, supt., State Office Bldg., Albany, constructing Cohoes-Waterford Bridge, Albany and Saratoga Counties, $268,344; adv. E.N.-R. Dec. 3.

Ohio—Dec. 8, by O. W. Merrell, dir. hys., Columbus, constructing concrete slab, concrete beam, creosoted timber, with steel girder or steel beam bridges in Ashtabula, Auglaize, Brown, Columbiana, Darke, Defiance, Fairfield, Fayette, Guernsey, Hancock, Jefferson, Knox, Mahoning, Montgomery, Paulding, Perry, Putnam, Scioto, Summit, Trumbull, Williams and Woods Counties, some of larger projects on three 30 ft. span, creosoted timber, steel girder bridge 24 ft. roadway, Sect. "I" Marquand Mills Rd., Coshocton Co., $13,543 — 75 ft. span steel beam bridge, Sect "N" Lima-Ottawa Rd., 24 ft roadway, Putnam Co., $17,940—58 ft. span, steel beam bridge, 24 ft. sidewalk, Sect. "L" Ottawa-Defiance Rd., Defiance Co., $22,425—two 42 ft. span, concrete beam bridge, 40 ft. roadway, two 5 ft. 8 in. sidewalks, Sect. "Washington C. H." Dayton-Cincinnati Rd., Fayette Co., $19,787—three 55 ft. span, concrete beam bridge over Mill Creek, 29 ft. roadway, two 3 ft. sidewalks, Sect. "K" Cambridge-Coshocton Rd., Guernsey Co., $56,019—45 ft. span, concrete beam bridge, 24 ft. roadway, Sect. "Q" New Lexington-Athens Rd., Perry Co., $13,674—42 ft. span, concrete beam bridge, 45.4 ft. roadway two 6 ft. sidewalks, Sect. "Akron," Akron-Kent Rd., Summit Co., $24,935—two 25 ft. span, concrete slab bridge, 24 ft. roadway, Sect "X" Niles-Ashtabula Rd., Trumbull Co., $10,445—two 24 ft. span, concrete slab bridge, 24 ft. roadway, Sect. "M-I" Columbus-Millersburg Rd., Knox Co., $16,706—three 20 ft span, one 25 ft. span, concrete slab bridge, 24 ft. roadway, Sect. "C" West Union-Portsmouth Rd., Scioto Co., $14,684. Total $386,430.

Wisconsin and Minnesota—Dec. 8, by Wisconsin State Hy. Comn., Madison, Wis., repairing Mississippi River Bridge on U. S. Hy. 16 between La Grosse, Wis., and La Crescent, Minn.

Okla., Oklahoma City—Dec. 7, by B. E. Carrigan, clk. Oklahoma Co., 6 span 97 ft. rein.-con. bridge at Spencer, $25,000; 3 span 330 ft. steel truss bridge on concrete piers at Eastern Ave., $60,000. J. F. Frazier, Court House, engr.

Wash., Seattle—Dec. 14, Comrs., King Co. Factoria Trestle, 2,312 ft. long, 20 ft. roadway on Lake Washington Hy. $25,000. T. D. Hunt, co. engr.

Wis., Green Bay—Dec. 8, by City, 170 ft. steel, concrete bridge, on Monroe St. $150,000. F. J. Steeno, city engr.

CONTRACTS AWARDED

Illinois—State Dept. P. Wks. & Buildings, Div. Hys., Springfield, to Clinton Bridge Wks., Clinton, Ia., bridges Sect. 136-B Christian Co. $11,177; Sect. 147-C Fulton Co. $17,028; Sect. 102-B Sangamon Co. $116,951; Sect. 101-B Sangamon Co. $9,178—to S. J. Groves & Sons Co., 306 Globe Bldg., Minneapolis, Minn., Sect. 23-R-B Cook Co. $7,588; Sect. G-RB Lake Co. $8,169—to S. J. Groves & Sons Co., Libertyville, Sect. 534-H DuPage Co., $70,588—to Deckert & McDowell, 53 West Jackson Blvd., Chicago, Sect. 430-V-D, Cook Co., $38,753—to Zimmerly Bridge Co., Paris, Sect. 120-X-B, Schuyler Co., $7,668—to J. C. Paskins Co., 208 South La Salle St., Chicago, Sect. 552-B DuPage Co. $27,701—to Acme Eng. & Constr. Co., 20 West Wacker Dr., Chicago, Sect. 534-H DuPage Co. $133,962—to Duffin Iron Co., 37 West Van Buren St., Chicago, Sect. 462-V-C, Cook Co. $342,351—to E. J. Albrecht Co., 2632 West 26th St., Chicago, Sect. 462-V-B, Cook Co., $110,584—to F. Hillquist, Geneva, Sect. 142-B Fulton Co., $38,679—to D. W. Chapman, Vienna, Sect. 111—V-B, Johnson Co. $[illegible]034—to Des Moines Asphalt Co., 2nd and New York Sts., Des Moines, Ia., Sect. 105-B, Marshall Co. $47,103—to F. D. Hayes, Janesville, Wis., Sect. 115-B, Lee Co. $7,984—to Madison Constr. Co., Edwardsville Sect. 124-B, Calhoun Co. $28,590—to Clinton Eng. Co., Clinton, Ia., Sect. 48-B, Peoria Co. $68,585—to G. W. Condon Co., 223 Grain Exch. Bldg., Omaha, Nev., Sect. 65-B $7,040; Sect. 66-B $6,248; Sect. 47-B $7,672, all Madison Co., to Mid-West Impvt. Co., 3825 South Leavitt St., Chicago, Sect. 7-Y-V Cook Co. $14,624—to H. C. Holmes, Macomb, Sect. 122-V-B, McDonough Co. $9,959—to S. J. Cohen, Blytheville, Ark., Sect. 136-1, Alexander Co. $41,841—to A. P. Munsen, Marion, Sect. 109-V-B, Carrol Co. $3,596. Grand total $1,185,653. Noted Oct. 29.

Indiana—State Hy. Comn., Indianapolis, 1 span 66 ft. steel girder, and two 41 ft. span rein.-con. girder bridge, Contr. 443, Porter Co., to H. B. Olney, East Chicago, $73,034. Est. $115,287. Noted Oct. 22.

Indiana—State Hy. Comn., Indianapolis, rein.-con. bridge over Bridge Creek, rein.-con. arch bridge over Deer Creek, Contr. 446, Tippecanoe and Carroll Counties, and rein.-con. girder bridges, one over Dry Owl Creek, other over Sugar Creek, rein.-con. arch bridge over Buck Creek, Contr. 445, Carroll Co., to F. J. Vester, Lafayette, $21,985 and $29,602, respectively. Est. $38,409 and $48,094 respectively—rein.-con. bridge over Haines Creek, Contr. 442, Jay Co., to M. J. Clark, East Chicago, $6,722. Est. $8,712. Grand total $58,309. Noted Oct. 22.

Iowa—See "Streets and Roads."

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., fabrication, erection structural steel superstructure, double 160 ft. span steel truss, for bridge over Monocacy River, Frederick-Libertown Rd., Contr. F-181-57, Frederick Co., to American Bridge Co., Continental Bldg., Baltimore, $27,757; structural steel girder span for proposed grade elimination over relocated tracks of Pennsylvania R.R., Elkton, Contr. Ce-122-23, Cecil Co., to McClintic-Marshall Corp., Bethlehem, Pa., $11,077—constructing 2 jetties at Ocean City, Contr. Wo-108 Worcester Co., to E. R. Boney, Norfolk, Va., $1,437, material for same to be furnished by owner. Grand total $40,271. Noted Nov. 12.

Md., Elkton—See "Railways, under Maryland."

Mo., Clayton—See "Bids Asked."

New York—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, bids about Jan. 1, temporary bridge across Little Hell Gate from Wards to Randalls Islands, and found. work on Ward's Island for Tri-Borough Bridge, connecting Manhattan, Bronx and Queens Boros.

N. Y., Buffalo—W. Rathman, comr. P. Wks., 240 ft. bridge over Buffalo River, at South Michigan Ave., to Wisconson Bridge Co., 5023 35th St., Milwaukee, Wis., $509,000. Noted Oct. 15.

Ohio—O. W. Merrell, dir. hys., Columbus, two 43 ft. span, creosoted timber bridge, Ashland Co., to McDonald Constr. Co., 27½ Summit St., Norwalk, $4,500—36 ft. span, concrete beam bridge, Coshocton Co., to M. & M. Constr. Co., Box 143, Wierton, W. Va., $5,621—three 40 ft. span concrete beam bridge, Logan Co., to N. A. G. Sunday, Antwerp, $17,202—36 ft. span, concrete beam bridge, Noble Co., to Edwards Constr. Co., Sunbury, $15,947—40 ft. span, concrete beam bridge, Seneca Co., to C. W. Overmeyer, 1104 West State St., Fremont, $7,469—three 45 ft. span, concrete beam bridge, Shelby Co., to L. C. Love, Sidney, $18,143—70 ft. span, steel beam bridge, two 3 ft. sidewalks, Crawford Co., to Wentz Co., 1200 Schofield Bldg., Cleveland, $13,296—24 ft. span, concrete slab bridge, Monroe Co., to E. A. Hatcher, Mingo Junction, $9,627—two 35 ft. span, concrete slab bridge Tuscawaras Co., to K. Miller, Canton, $14,430, all above to have 24 ft. roadway—24 ft. span, concrete slab bridge, two 3 ft. sidewalks, 6 ft. span,

Constr. News page 201a

Bridges (Continued)

concrete slab and girder bridge, two 3 ft. sidewalks, both 30 ft. roadway, Sect. "A" Lock 17-New Philadelphia-Northern Rd., Tuscawaras Co., to C. L. Moore, 3494 Lee Rd., Shaker Heights $19,211—two 25 ft. span, concrete slab bridge, 24 ft. roadway, Williams Co., to J. A. Elder, Bryan, $7,546—14 x 7 x 72.25 ft., concrete box culvert, Sect. "Bol" Caldwell-Barnesville Rd., Noble Co., to W. J. Elliott, McConnellsville, $6,236—two 80 ft. central span, two 64 ft. end span, continuous steel beam bridge, 24 ft. roadway, two 3 ft. sidewalks, Ottawa Co., to Dodge-Hussey Inc., 1174 West 5th Ave., Columbus, $83,987. Grand total $223,215. Noted Nov. 12.

Pennsylvania—State Hy. Dpt., Harrisburg, 10 span 0.3 mi. structural steel, rein.-con. viaduct, 18 ft. wide, Clifford Twp., Susquehanna Co., to L. L. Keister, 211 North Front St., Lewisburg. Contract let Oct. 23. Noted Oct. 15 under "Streets and Roads."

Virginia—See "Streets and Roads."

STREETS AND ROADS

PROPOSED WORK

New York—Westchester Co. Park Comn. 72 West Pondfield Rd., Bronxville, Long Island Park Comn., Babylon, and New York City, parkway system using Tri-Borough Bridge, connecting Westchester Parkways with Long Island Parkways. $20,000,000.

BIDS ASKED

California—Dec. 9, at office C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, untreated crushed gravel or stone surfacing 0.9 mi. Dyerville Bridge Approaches, Humboldt Co. —removing 36 trees, existing pavement, bridge, and grading, concrete paving 0.6 mi. at Madera, Madera Co.

Calif., Los Angeles—Bd. P. Wks., City Hall, received no bids Nov. 18, grading, curbing, guttering, sidewalks, waterworks 1,900 sq.ft. oiled roadway and 6 in. concrete paving 137,099 sq.ft. Baird Ave. from Saticoy to Sherman Way, other streets in Baird Avenue and Valerio Street Impvt. Dist. Will probably readvertise. To exceed $25,000. J. J. Jessup, City Hall, engr. Noted Nov. 5.

Calif., Ventura—Dec. 9, by Director Joint Hy. Dist. 6, Ventura Co., Court House improving Casistas Pass Division of Marciopa-Carpinteria Hy. between Ojai and Carpenteria, incl. 112,000 cu.yd. earth and 200 cu.yd. structural excav., 34 cu.yd. Class A structural concrete, 1,900 lb. reinforcing steel, 762 lin.ft. 18- to 30-in. corrugated metal pipe, 27,000 lin.ft. standard stock fence. $40,000. C. W. Petit, Court House, engr.

Delaware—Dec. 22, by State Hy. Dpt., Dover, grading, concrete sidewalks, 30,000 sq.ft. Price's Corner to Marshallton, Contr. 107—9,000 sq.ft. Cheswold-Bishop's Corner, Contr. 234— grading, concrete paving 3,575 cu.yd. Kenton-Blackiston Crossroads, Contr. 184—grading 2.2 mi. Dual Rd., Hare's Croner-Farnhurst, Contr. 218—clearing, grubbing, grading, concrete paving 1.5 mi. Washington St. Extension to Philadelphia Pike Contr. 224—clearing, grubbing 0.62 mi. Delaware Colony Rd., Contr. 233; adv. E.N.-R. Dec. 3.

Florida—Dec. 7, by State Road Dpt., Tallahassee, laying, priming Florida lime rock base 8½ in. compacted 11.9 mi. Project 918, Road 22, Orange Co. B. M. Duncan, Tallahassee, state hy. engr.

Idaho—Dec. 8, by A. Harbour, comr. P. Wks., Boise, grading, crushed rock surfacing 9,500 cu.yd. Palouse Hy. between Cougar Gulch and Mica Bay, Kootenai Co.

Ind., Ft. Wayne—Bd. Park Comrs., D. N. Foster, pres., bids about Dec. 12, St. Joseph River Blvd., combination dike and roadway along west bank river from Wagner St. to State Boulevard Bridge. $210,000.

Ind., Winchester — Dec. 8, by Bd. Comrs. Randolph Co., grading, drainage structures, concrete and bituminous paving 15,705 ft. W. S. Preston Rd. White River Twp. $54,603. O. W. Brown, Winchester; co. aud.

Kentucky—Dec. 22, by State Hy. Dpt., Frankfort, grading, drainage structures, surfacing 5 mi. Scottsville-Bowling Green Rd., Allen Co.; grading, drainage structures 0.5 mi. approaches to Kentucky River Bridge at Gratz, Henry and Owen Counties. B. Johnson, chn.

Michigan—Dec. 8, by A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage, 2 course gravel surfacing 7.154 mi. F040-12C-1, Kalkaska Co.; 6.742 mi. F020-11C-1, Crawford Co., for State Hy. Comn., Lansing.

Michigan—Dec. 8, by W. J. Kingscott, div. engr., 309 McNair Bldg., Kalamazoo, grading, shaping, drainage, concrete paving 0.475 mi. F011-26C-2, Berrien Co., for State Hy. Comn., Lansing.

Michigan—Dec. 8, by J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures 2.1[illegible] mi. F055-4C-3 and 4, Menominee Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, drainage structures 8.023 mi. MO37-19C-1, Isabella Co., for State Hy. Comn., Lansing.

Michigan—Dec. 9, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, drainage structures 0.822 mi. F070-25C-1, Ottawa Co., for State Hy. Comn., Lansing.

Michigan—Dec. 11, by H. G. Oakes, div. engr., Plymouth, grading, drainage structures 12.538 mi. FO23-10C-1, Eaton Co., for State Hy. Comn., Lansing.

Michigan—Dec. 16, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, widening grade and concrete paving 2.313 mi. U. S. 23, Mt. Morris North, Genesee Co., for State Hy. Comn.,

Mo., Clayton—St. Louis, Co., Court House, soon takes bids rein.-con. paving 5,500 ft. Hanley Rd., 20 ft., $40,000. Grading and draining will be done by day labor. R. Jablonsky, Court House, co. engr.

N. Y., Brooklyn—Dec. 9, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, curbing, flagging, Mansfield and Bushwick Pls., Bushwick Ave., Coffey, East 18th, East 31st, Gold, Pine and 70th Sts.

N. Y., New York—Dec. 9, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks on Matilda, Barnes, Patterson and Underhill Aves.

N. Y., New York—Dec. 11, by S. Levy, pres. Manhattan Boro, Municipal Bldg., superstructure with ramps complete 12th and 13th Aves., Marginal St. and Thomas Smith Park from West 22nd to West 38th Sts., in connection with elevated highway with ramp approaches along waterfront Hudson River from Canal to West 72nd Sts. Contr. 8 Div. 1.

Okla., Oklahoma City — Dec. 7, by B. E. Carrigan, clk. Oklahoma Co., Court House, grading, drainage structures, gravel surfacing 5 mi. County Rd. 4, $25,000—4 mi. County Rd. 14, $25,000—8 mi. County Rd. 11 $30,000—3 mi. County Rd. 53 $25,000, all above roads 30 ft. wide—concrete slab surfacing 4.52 mi. May Avenue Rd., 20 ft., $10,800. J. F. Frazier, Court House, engr.

Pennsylvania—Dec. 18, by State Hy. Dpt., Harrisburg, surfacing 8 mi. 5 projects, incl. bridges, in Berks, Greene, Lancaster, Montgomery and Schuylkill Counties. S. S. Lewis, secy.; adv. E.N.-R. Dec. 3.

Tex., Brownsville—Dec. 17, by Cameron Co., c/o O. C. Dancy, judge, concrete paving 4.1 mi. Olmito North Rd., 18 ft. W. O. Washington, Brownsville, co. engr.

Virginia—Dec. 8, by State Hy. Dpt., Richmond, clearing, grubbing, grading, gravel or macadam surfacing 5 mi. Intersection 3 Chopt Rd., Route 19 Project S-719-C, incl. bridge over 20 ft. over Deep Run Creek, Henrico Co. H. G. Shirley, hy. engr.

Wash., Seattle—Bd. P. Wks., bids about Dec. 1, precast concrete slab paving open street car tracks on Dexter Ave. $40,000. D. W. McMorris, Seattle, engr.

Ont., Leamington—See "Contracts Awarded."

Que., Quebec—Deputy Minister, Dpt. Roads, soon takes bids grading road between Nominingue to Duhamel, $16,800—widening St. Romuald Hy., $43,750—road between Newport and Gaspe, $43,750—Quebec Lake St. John Hy., $175,000—St. Simeon Hy., $140,000—Fabre-Temiskaming Rd. $43,750—and Lauson-Levis Hy., $49,000.

CONTRACTS AWARDED

Alabama — State Hy. Comn., Montgomery, guard rail, shoulders, concrete paving 23.5 mi. Wilmer Rd., Mobile Co., to Van Gordon Constr. Co., Jacksonville, Fla., $278,041. State furnishes cement, unit price $0.81 per sq.yd. Noted Oct. 29.

Calif., Los Angeles—Harbor Dpt., 112 City Hall, B. Edwards, genl. mgr., paving at Berths 145 and 146, to Griffith Co., 502 Los Angeles Railway Bldg., $13,300—improvements on Fries Ave. and Water St., to Sully-Miller Constr. Co., 1500 West 7th St., Long Beach, $4,367—paving miscellaneous small areas, to Osborne Co., 450 California Terrace, Pasadena, $3,680. Grand total $21,347. Est. $25,000.

Calif., Los Angeles—Bd. P. Wks., City Hall, curbing, guttering, sidewalks, ornamental lighting system, appurtenances, 7 in. concrete paving Vista Del Mar between Fowler Ave. and Pine St., to J. L. McClain, 3452 West Slauson Ave., $77,982; sanitary sewers, appurtenances in right-of-way in Temescal Canyon between point 3,160 ft. northerly from Malibu Rd., et al. to M. Ramljak & J. Sutalo, 476 Camulos St., $10,699.

Calif., Los Angeles—Los Angeles Co., improving 5,170 lin. ft. Centre St. from Somerset Ave. to San Gabriel River, to G. H. Oswald, 366 East 58th St., $28,248. Noted Nov. 5.

Delaware—State Hy. Dpt., Dover, to Joseph S. Hamilton Co., 829 Orange St., Wilmington, grading, concrete sidewalks, 2.35 mi. Farnhurst to Wilmington City Line, Contr. 204, $15,449; 1.25 mi. Rosehill School to Eden Park Contr. 205, $12,183; 0.5 mi. City Line to Shellpot, Contr. 206, $4,787. Grand total $32,419. Noted Oct. 1.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, to Arcole Constr. Co., Niles Center, paving Sect. 115, Lee and De Kalb Counties $160,954, Sect. 542 DuPage Co. $108,000; Sect. 464-M-Y Cook Co. $37,925—to Bishop Constr. Co., Danville, Sect. 101 Jasper Co. $76,495—to Chicago Heights Coal Co., Chicago Heights, Sect. 524 $257,776; Sect. 539-X, $81,065, both Cook Co.—to Cameron-Joyce Co., Keokuk, Ia., Sect. 105, McDonough Co., $81,949—to J. R. Feigel Co., 605 Adams Ave., Evansville, Ind., Sect. 107-S, Johnson Co. $6,951—to Gund-Graham Co., Freeport, Sect. 106, Kane Co. $108,764; Sect. 102, Mercer Co. $128,500—to H. H. Gunthur Constr. Co., 550 South Cedar St., Galesburg, Sect. 1-W, Knox Co. $3,819—to Hartman-Clark Bros. Co., 920 Peoria Life Insurance Bldg., Peoria, Sect. 124-X, McLean Co. $2,738; Sect. 46-X $10,64 Sect. 46-X-1 $14,584; Sect. 48-X $5,01 Sect. 126 $13,523, all Peoria Co.; Sect. 13 Christian Co., $107,438; Sect. 115, Pratt C $88,238—to J. Kesl & Sons, Edwardsvill Sect. 134, Alexander Co. $99,932—to I. D Lain Co., Park Ridge, Sect. 86-Y $39,58 Sect. 584-Y $112,156; Sect. 430-G $106,41 all Cook Co.—to McCarthy Impvt. Co., Kah Bldg., Davenport, Ia., Sect. 103, Mercer Co $91,200; Sect. 106, Union Co. $162,633; Sect 107 Johnson Co. $128,210; Sect. 105-W, Ogle Co. $2,428; Sect. 105-W. Ogle Co. $6,843 grading drainage structures Sect. 142-A Knox and Fulton Counties $59,989—to P. F. McFarland Co., Jolist, paving Sect. 536-W. Will Co. $11,259—to McMahon Constr. Co., Rochester, Ind., Sect. 125-X, Livingston Co. $6,282—to A. E. Meyer Constr. Co., Highland Park, Sect. 88-1-Y, Cook Co. $73,845—to Nelock Constr. Co., Jerseyville, Sect. 103, Montgomery Co., $47,645—to J. C. O'Connor & Sons Constr. Co., 2104 Miner Ave., Ft Wayne, Ind., Sect. 143-X, Christian Co. $31,204 —to E. D. Otto, Downers Grove, Sect. 113-W, Will Co. $5,377—to Pronger Constr. Co., Blue Island, Sect. 146, Cook Co. $24,303—to Stanley Jaicks, Oak Park, Sect. 534-X DuPage Co $132,168—to G. Welch, Beloit, Wis., Sect. 631-X-1, Cook Co., $12,868—to S. J. Groves & Sons Co., Libertyville, grading, drainage structures Sect. 122-A Calhoun Co. $88,748—to Jensen & Schaefer, Pekin, Sect. 105-A, Putman Co. $56,881—to M. Wunderlich, St. Paul, Minn., Sect. 116-A, Johnson Co. $59,612; Sect. 101-A, Sangamon Co. $24,721—to T. McQueen, Forest Park, gravel surfacing Sect. 8-V-A, Cook Co. $14,896. Grand total $2,693,579. Noted Oct. 29.

Iowa—State Hy. Comn., Ames, crushed stone surfacing 3.5 mi. P-652, Henry Co., to McManus Quarries Co., Keokuk, $2,745—graveling paved shoulders P-758 Polk Co., to L. J. Peters, 3400 Carlisle Rd., Des Moines, $1,128—850 cu.yd. stone riprap, P-685, Mahaska Co., to E. A. Kramme Co., 3200 East 8th St., Des Moines, $3,128—two 160 x 24 ft. span high truss bridge with four 50 x 24 ft. I-beam approach spans, F.A.B.-9, Johnson Co., to Snyder & Johnson, Humboldt, $49,008—2 culverts, same project to W. C. Mott & Son, Iowa City, $492. Grand total $56,601.

Kan., Kansas City—City, c/o H. Payne, city clk., grading, curbing, brick paving State Ave. from 25th St. west to city limits, to R. R. Schooley, Kansas City, $87,161.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures, using 1st class rein.-con. pipe 1.55 mi. State Project 403-AG, Monroe Co., to Cumberland Constr. Co., Burkesville, $9,865 —Class A concrete with mesh reinforcement paving slopes on east approach to toll bridge over Green River at Spottsville, State Project 8-C2, Henderson Co., to Cole & Moore, Paducah, $7,701. Noted Nov. 12.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 0.88 mi. section hy. from end Flower Ave. at Sligo Ave. in Takoma Park to Franklin Ave., Contr. M-196-35, Montgomery Co., to L. R. Colbert, Fredericksburg, Va., $14,326. Noted Nov. 19.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 6.013 mi. hy. along Oldtown-Paw Paw Rd. from end of Contr. A-110 at Town Creek to Paw Paw, Contr. A-111-64, Allegany Co., to Thomas, Bennett & Hunter, Westminster, $100,535. Noted Nov. 5.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 19,306 ft. hy., incl. rein.-con., arch bridge extension and plate girder bridge, Needham and Wellesley, to B. Perini & Sons, Inc., Ashland, $251,424. Noted Nov. 12.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 14,330 ft. hy., incl. 2 span plate girded bridge, Brookline and Boston, to M. McDonough Co., Broadway, Malden, $465,260. Noted Nov. 12.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., rein.-con., bituminous macadam (dual type) paving 21,402 ft. hy., incl. 3 span, steel stringer bridge, Lakeville and Middleboro, to Arute Bros., 513 South Main St., New Britain, Conn., $243,468. Noted Nov. 12.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., State House, Boston, bituminous macadam paving 12,996 ft. hy., incl. rein.-con bridge, rein.-con. bridge extension, Salem and Swampscott, to M. McDonough Co., Saugus, $108,411. Noted Nov. 12.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 1,500 ft. hy., rein.-con. bridge, Uxbridge, to Waterbury Road Constr. Co., 983 Main St., Hartford, Conn., $41,811. Noted Nov. 12.

Mass., Boston—Metropolitan Dist. Comn., 20 Somerset St., Parks Div., relocating Bold Knob Rd., to J. Susi & Bro., 64 Richfield St., Dorchester. Est. $25,000.

Mass., Boston—Dpt. P. Wks., A. J. Rourke, comr., sheet asphalt paving Orange St., to H. F. Malley, 96 Tyndale St., Roslindale, $24,393 est. $25,000 or more; bituminous macadam repaving, laying, relaying water pipes in Corey Rd., Roslindale, to C. M. Callaham, Inc., 23 South Fairview St., Roslindale, est. $15,000.

Nevada—Dir. Hys., Carson City, grading, mineral aggregate paving 29.46 mi. hy. between Sand Springs and Eastgate, Churchill Co., to

Streets and Roads (Continued)

Dodge Bros., Inc., Fallon, $87,343. Noted Nov. 12.

N. J., Midland Park—Bd. Boro Council, Boro Hall, grading, bituminous macadam paving Paterson Ave., to S. Braen, Nelson St., Hawthorne. Est. $25,000.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., asphalt paving Beverly Rd. $7,278; East 31st St. $2,855; Newkirk Ave. $11,558—to Highway Impvt. & Repair Co., Furmans Island, Bradford St. $4,691; Green St. $7,938—to B. Tureeamo Contg Co., New Cropsey Ave., East 93rd St. $5,163; Lake St. $5,503; Ovington Ave. $3,064; 19th Ave. $6,587; 68th St. $2,505. Grand total $57,142. Noted Nov. 5.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., asphalt paving East 71st St., to Carbloc Paving Co., Stagg St., Brooklyn, $11,064—West 153rd St., to Venetian Contg. Co., 2 Lafayette St., $4,936—Stone St., to Meehan Paving Co., 90 West St., $3,550—West 103rd St., to E. T. Barry, 126-06 139th Ave., Laurelton, $8,045—York Ave., to St. George Paving Co., 415 Lexington Ave., $22,877. Grand total, $50,472. Noted Nov 12.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, concrete paving Victory Blvd., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $20,007. Noted Nov. 12.

O., Berea—City Council, concrete paving 3 streets, to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, $54,734. Est. $76,000.

Oklahoma—State Hy. Dpt., Oklahoma City, to J. E. Smith, Noble, grading, drainage structure 8.055 mi. road in Pontotoc Co. $51,593 est. $60,000—to D. Sweeney, Empire Bldg., Oklahoma City, 4.767 mi. Jackson Co., $17,126 est. $25,000—to Moran & Buckner, Muskogee, 6.637 mi. State Aid Project 794-B $25,904 est. $30,000; 7.874 mi. State Aid Project 328-A, $25,552 est. $28,400; 7.717 mi. Sect. B, same road $26,061 est. $30,000; 6.892 mi. Sect. C, same road $25,411 est. $30,000, all foregoing in Atoka Co. Grand total $171,647. Noted Nov. 5.

Okla., Tulsa—Bd. City Comrs. widening 6 blocks East 4th St. from Greenwood to Owasso Aves., 20 ft., to Standard Paving Co., 2119 East 11th St., Tulsa, $27,734. Est. $28,000.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, paving 6.366 mi. road in Wilson Co. and 4.24 mi. Robertson Co., to Municipal Paving & Constr. Co., Cotton States Bldg., Nashville, $128,481 and $75,836 respectively—4.357 mi. Roane Co. and 5.219 mi. Henry Co., to Zeigler Constr. Co., American Trust Bldg., Nashville, $65,655 and $62,693 respectively—6.449 mi. Polk Co., to G. H. Fisher, Lenoir City, $94,474—grading, drainage structures 5.699 mi. Van Buren Co., to Bell & Bell, 101 Broad St., Nashville, $54,636—road in Lincoln Co., to Young & Lyons, Rogersville, $60,538—Franklin Co., to Boyd-Williams Constr. Co., Murfreesboro, $51,905. Grand total $594,218.

Tex., Kilgore—For 2 in. asphalt on 6 in. crushed rock paving 6 blocks, to O. L. Crigler, Kilgore, $28,000.

Tex., Pampa—R. C. Wilson, aud. Gray Co., concrete paving (Bates type), 4.524 mi. County Rd. Jobs 4 and 5, 18 ft., to Stuckey Constr. Co., Pampa, $79,066 grading, drainage structures 9.48 mi. County Rd. Job 6, to H. Lott, Pampa, $41,190.

Virginia—State Hy. Dpt., Richmond, cold bituminous surfacing 0.921 mi. Route 39, Henrico Co., to Atlantic Bitulithic Co., Munsey Bldg., Wash., D. C., $23,761—top-soil surfacing 2 mi. Route 57, Pittsylvania Co., to M. S. Hudgins, Roanoke, $23,178—2.6 mi. Route 57, Halifax Co., to L. Teer, Amherst, $12,390—constructing bridge over Flat Creek, Route 43, Campbell Co., to R. G. Witt Co., Marion, $4,269. Grand total $63,598.

Washington — State Hy. Dpt., Olympia, crushed stone surfacing 1.873 mi. Lewis Co., to J. G. Johnson, 109 East 62nd St., Tacoma, $25,700—17.1 mi. Grays Harbor Co., R. O. Dail, 2717 Simpson Ave., Aberdeen, $9,439—25.6 mi. Wahkiakum and Pacific Counties, to Penttila & Bighill, Naselle, $17,840—35.012 mi. Lincoln and Ferry Counties, to F. R. Hewett, 420 West 22nd St., Spokane, $58,576—2.968 mi. Stevens Co., to Sampson, Hohner & Malone, P. O. Box 866, Wenatchee, $6,204. Grand total $117,759. Noted Nov. 12.

Ont., Leamington — Dpt. Hys., Parliament Bldg., Toronto, grading, drainage structures, culverts, ditching road from Leamington to Amherstburg, day labor. Est. $125,000. A. A. Smith, Parliament Bldg., Toronto, engr.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ia., Albia—See "Dams."

Pa., Jamestown—Commissioners of Pennsylvania, Harrisburg, soon takes separate bids clearing 9,000 acres swamp land $200,000, constructing concrete road from Andover, O. to Espyville, Pa., of which 6,000 ft. will be over swamp land, also bridge middle of dam site near here. Total $1,150,000. C. E. Ryder, ch. engr. Water & Power Resources Bd., Harrisburg, engrs.

Tex., Donna—Donna Irrigation Dist., H. S. Ridgeway, mgr., plans approved, $1,700,000 bonds voted and approved. Concrete lining of canals, irrigation system of about 43,000 acres, involving 6,600,000 sq.ft. concrete or gunite lining; 1,238 cu.yd. concrete; 132,000 lb. steel; 1,150 ft. 42 in., 2,500 ft. 20 in.; 12,537 ft. 24 in., 13,513 ft. 20 in., 25,893 ft. 18 in., 34,140 ft. 16 in., 11,186 ft. 14 in., 25,535 ft. 12 in. and 7,270 ft. 10 in. concrete pipe. Work held up, unable to sell bonds. A. Tamm, Harlingen, civil engr. Noted Jan. 2, 1930.

Tex., Edinburg—Hidalgo Co. Water Control & Impvt. Dist. 1, Edinburg, H. W. Nutting, mgr., gave option on $900,000 bonds to Fuller Constr. Co., Republic Bank Bldg., Dallas, irrigation system for about 36,000 acres. The contractor to construct about 4,500,000 sq.ft. gunite of concrete canal lining, about 5 mi. of pipe line and all structures in canals to be lined. A. Tamm, Harlingen, engr. Noted May 7.

Tex., Edinburg—Hidalgo Co. Water Impvt. Dist. 6 of Engelman Gardens, A. L. Cramer mgr., Edinburg, irrigation system of about 11,500 acres has $257,000 worth of bonds unsold. The proceeds to be used for concrete pipe irrigation system. Work is held up on account of poor bond market. A. Tamm, Harlingen, civil engr.

Tex., Harlingen—Cameron Co. Water Control & Impvt. Dist. 19, W. A. Trumpe, pres. Bd. Directors, plans before State Bd. Water Engineers, for approval irrigation system of about 10,000 acres, involving 1,753,515 cu.yd. earthwork; 1,290,700 sq.ft. concrete lining, 252 canal structures, various sizes: 4,569 ft. 8 in., 6,343 ft. 10 in., 43,144 ft. 12 in., 56,629 ft. 14 in., 41,532 ft. 16 in., 28,500 ft. 18 in., 10,387 ft. 20 in., and 13,840 ft. 24 in. concrete pipe; 7,566 expansion joints for concrete pipe, various sizes; 500 ft. 12 in.; 300 ft. 14 in., 400 ft. 18 in., 350 ft. 20 in., and 500 ft. 24 in. iron pipe; 545 delivery gates and meters; 1,089 pipe line structures; two 200 hp. motors and 30 in. pumps; 7 small re-lift pumps. $950,000 bond election will be called when plans are approved. A. Tamm, Harlingen, civil engr. Noted July 9.

BIDS ASKED

Calif., Ventura—See "Streets and Roads."

Ill., Waterloo—Dec. 7, by City, E. C. Jobusch, mayor, deepening city reservoir, incl. 16,000 cu.yd. excav.

CONTRACTS AWARDED

N. J., Belmar—City Council, 400 ft., steel, stone jetty, 16th Ave., to T. Proctor, Long Branch, $23,781. Noted June 11.

N. J., Jersey City—Bd. City Comrs., City Hall, new timber bulkheads additional dry docks, filling in lands, to J. Richard Steers, 17 Battery Pl., New York. Est. $32,000. Morris Basin Dry Dock Co., foot Henderson St., lessee. Noted July 9.

Bond Elections

Coming Bond Elections

Drilling Wells to Augment Water Supply—San Clemente, Calif. $15,000.

Filtration Plant, 3,000 ft. Intake—Wilmette, Ill., Dec. 5. $6,000,000. Pearse, Greeley & Hansen, engrs.

Waterworks—Holcomb, N. Y., Dec. 5. $32,500.

Sewers—Battle Creek, Mich., Dec. 31. $200,000.

Sewage Disposal Plant—Bemidji, Minn., February, $35,000. Wolf & Coales, St. Paul, engrs.

Bonds Voted

Sewage Disposal Plant and Sewers—New Richmond, Wis. $44,000.

School—Clinton, N. Y., $350,000. A. E. Gilbert, 358 5th Ave., New York, archt.

Schools—Dobbs Ferry, N. Y., $785,000. J. T. McCormack, pres. School Bd.

Bonds Defeated

Water Storage Reservoir, etc.—San Jose, Calif., Santa Clara Co. Water Conservation Dist., $6,000,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., San Francisco—PUMP HOUSE, etc.—Con. Q.M., Fort Mason, pump house, 2,000 lin.ft. c.i. pipe, valves, one 1,000 gal. centrifugal pump and motor.

Fla., Tampa—DREDGING—U. S. Eng., Jacksonville, dredging entrance to Tampa Bay from Gulf of Mexico, by government dredge. $33,000. Noted Nov. 26.

Ia., Des Moines—HOSPITAL—Vet. Bu., Arlington Bldg., Wash., D. C., U. S. Veterans Hospital group. $1,300,000.

Kansas—WASH BORINGS etc.—U. S. Eng., Kansas City, Mo., 2,820 lin. ft. wash borings; 11,290 lin. ft. diamond drilling in Kansas Valley at Kiro Sta. Shawnee Co.

Md., Baltimore — APPRAISERS STORES — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Taylor & Fisher, Baltimore Trust Bldg., and W. H. Stone, 2612 North Calvert St., assoc. archts., brick, concrete, Gay and Lombard Sts. $1,000,000.

Miss., Columbia — POST OFFICE — Treas. Dpt. at office Sup. Archt., Wash., D. C., 1 story, brick, concrete, stone, Main St. $70,000.

Miss., Hattiesburg—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., sketches by R. Debuys, Hibernia Bank Bldg., New Orleans, and J. K. Landry, Hattiesburg, U. S. Post Office and Court House. $245,000. Noted Nov. 26.

N. J., Dover—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., sketches 2 story, basement, brick, steel, rein.-con., Warren and Dickerson Sts. $150,000.

N. Y., Batavia—HOSPITAL—Vet. Bu., Arlington Bldg., Wash., D. C., U. S. Veterans Hospital, within 40 mi. radius of here. $1,000,000.

N. Y., Port Chester—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C. bids late in spring, U. S. Post Office, Westchester Ave. $200,000. Zoller & Muller, 441 Lexington Ave., New York, archts. Noted Oct. 22.

Okla., El Reno — WATERWORKS — Treas. Dpt. at office Sup. Archt., Wash., D. C., preliminary plans water supply and distribution system, 2 mi. west of here, for new Federal Reformatory Bureau Prisons, S. Bates, supt. $25,000. Hawk & Parr, 1019 Hales Bldg., Oklahoma City, Okla. archts.

Pa., Ellwood City—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Thayer Co., 407-11 Greer Bldg., New Castle, 1 story, basement, 160 x 160 ft. brick, stone, Crescent and 7th Aves. $135,000.

Texas—DREDGING—U. S. Eng., Galveston, plans survey and report by February for canalization 300 mi. Trinity River from Fort Worth to Galveston, for U. S. Government c/o Rivers and Harbors and Trinity River Canalization Assn.

Tex., Harlington—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids in January or February, 2 story, rein.-con., hollow tile, stone, East Van Buren St. $170,000. Irving D. Porter, Federal Bldg., Dallas, archt. Noted June 4.

Tex., San Antonio—SHOPS—Con. Q.M., 3 blacksmith shops, 18 stables for auto and truck repairing, Camp Bullis, 18 mi. north of here.

BIDS ASKED

Ala., Mobile—WHARF—Dec. 7, by Treas. Dpt. at office Sup. Archt., wharf at U. S. Quarantine Station.

Ark., Hot Springs—HOSPITAL—Vet. Bd., Arlington Bldg., Wash., D. C., bids about Dec. 1, Army and Navy Hospital. $1,500,000.

Conn., New London—QUARTERS—Dec. 14, by Con. Q.M., 2 officers quarters, 2 concrete tennis courts, fences at Coast Guard Academy.

D. C., Wash.—LIBRARY—Jan. 12, at office D. Lynn, archt. of Capitol, addition to Library of Congress; adv. E.N.-R. Dec. 3. Noted Nov. 26.

Fla., Miami—DREDGING—Dec. 23, by U. S. Eng., Jacksonville, 1,175,000 cu.yd. place measurement in Miami River; adv. E. N.-R. Dec. 3.

Fla., St. Petersburg—HOME—Jan. 5, by Vet. Bu., Arlington Bldg., Wash., D. C., building and utilities at U. S. Veterans Home, adv. E.N.-R. Dec. 3. Noted Nov. 12.

Ga., Atlanta—POST OFFICE—Dec. 28, by Treas. Dept. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Sept. 24.

Idaho—BRIDGE—Dec. 10, by Pub. Rds., Dpt. Agriculture, steel bridge, approaches on North Fork-Payette, Station 152+96 to Station 157+00, National Forest Rd., Project 23-A6, Payette Natl. Forest, Boise Co.

Ia., Sioux City—POST OFFICE—Dec. 7, by Treas. Dpt. at office Sup. Archt., Wash., D. C., clearing site of U. S. Post Office. Noted Oct. 22.

Ky., Lexington—FOUNDATIONS—Dec. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., found. for U. S. Narcotic Farm Building. Noted Sept. 24.

La., New Orleans—QUARANTINE STATION—Dec. 21, by U. S. Eng., quarantine station.

Mich., Alma—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Dec. 19, general contract 2 story, basement, brick, rein.-con., plain found. $100,000. Franz & Spence, 118 North Washington Ave., Saginaw, archts.

N. H., Exeter—POST OFFICE—Dec. 21, by Treas. Dpt. at office Supt. Arch., U. S. Post Office.

N. J., Fort Hancock—THEATRE—Con. Q.M., Fort Hancock bids about Dec. 15, general contract 1 story, basement theatre. $150,000. Private plans. Noted Nov. 19.

N. C., Wilmington—HOPPER DOORS—Dec. 14, by U. S. Eng., 308 Customhouse, hopper doors, for U. S. Dredge Comstock, f.o.b. Wilmington.

Va., Langley Field—MACHINE SHOP, etc.—Dec. 15, by Con. Q. M., reconstructing, repairing machine shop 95, 1 story, 66 x 140 ft. steel, tile; installing steam heating radiators in Balloon Hangar Building 83; constructing heating plant.

Va., Lynchburg—ELEVATOR PLANT—Dec. 8, by Treas. Dpt. at office Sup. Arch., Wash., D. C., complete elevator plant in U. S. Post Office.

Czechoslovakia, Prague—ALTERING — Jan. 12, by Foreign Buildings Office, State Dpt., Wash., D. C., altering and repairing U. S. Legation.

Federal Government (Continued)

CONTRACTS AWARDED

Ala., Montgomery—QUARTERS—Con. Q.M., 21 sets company officers quarters at Maxwell Field, to Samford Bros., 301 Washington St., $218,500. Noted Oct. 29.

Calif., Alameda—SEWERS—U. S. Eng., San Francisco, storm and sanitary sewers, to City Constr. Co., 1024 East 22nd St., Oakland, $23,758. Noted Oct. 29.

Calif., Sacramento — LEVEE — U. S. Eng., Moulton Weir Levee, to C. W. Wood, Stockton, $24,727.

Conn., Waterbury — ELEVATOR PLANT — Treas. Dpt. at office Sup. Archt., Wash., D. C., complete elevator plant at U. S. Post-Office, to Warsaw Elevator Co., North Main St., Springfield, Mass., $5,490.

D. C., Wash.—STEEL—G. A. Fuller Co. (contractors), Munsey Bldg., 4,900 tons structural steel for supreme court, to McClintic-Marshall Co., 30 Bway., New York. Contractor soon lets other separate contracts. Noted Nov. 19, under "Contracts Awarded."

Fla., Lake C[illegible]—WATER SUPPLY—Vet. Bu., Arlington Bldg., Wash., D. C., new water supply, to McClelland Co., 9 West 3rd St., Charlotte, N. C., $25,000. Noted Oct. 15.

Ga., Fort Valley—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Emmett-Williams, Monroe, $38,990. Noted Nov. 5.

Ga., West Point—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Barge Thompson Co., 136 Ellis St. N. E., Atlanta, $39,445. Noted Nov. 5.

Idaho—ROAD—Pub. Rds., Dpt. Agriculture, Ogden, Utah, grading, draining 3.405 mi. National Forest Rd., Payette Natl. Forest, Boise Co., to T. A. Tortelling, Spokane, Wash., $106,187. Noted Nov. 10.

Illinois — EARTHWORK— U. S. Eng., 428 Custom House, St. Louis, Mo., rebuilding Keach Drainage and Levee District, Green Co., to U. S. Hardwick, Beardstown, $269,360. Noted Oct. 22.

Ind., Indianapolis—COAL BUNKER—U. S. Vet. Bu., Arlington Bldg., rein.-con. coal bunker at Veterans Hospital, to F. M. Cooley, 5675 Winthrop Ave. Noted Oct. 15.

Ind., Mount Vernon—POST OFFICE—Treas. Dpt. at office Sup. Archt., rein.-con., stone, brick, 3rd and Walnut Sts., to Ideal Constr. Co., 515 West 5th Ave., Gary. Noted Oct. 22.

Mass., Andover—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to S. Durso & Sons, 455 Market St., Lawrence, $95,000. Noted Nov. 12.

Mass., Watertown—POWER PLANTS—U. S. Eng., Watertown, 13 gasoline electric power plants to Westinghouse Elevator & Mfg. Co., 10 High St., Boston, $20,280. Noted Oct. 29.

Mo., Kansas City—REVETMENT—U. S. Eng., 707 Postal Telegraph Bldg., 200 ft. standard revetment and 300 ft. repairs at Deapolis Bend, to Dakota Concrete Co., Minot, N. D., $8,619.

Mo., Miami—PILE DIKES—U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 8,450 ft. standard pile clump and standard batter pile dikes and 3,600 ft. standard revetment at Teteseau and Thomas Bend, 2.5 mi. upstream from here, to W. A. Ross Constr. Co., 25th and Summit Sts., Kansas City, $181,964.

Okla., El Reno — REFORMATORY — Bureau Federal Prisons, administration and receiving building for U. S. Reformatory, to W. S. Bellows, Oklahoma Savings & Loan Bldg., Oklahoma City, $227,000. Est. $250,000. Noted Nov. 12.

S. C., Columbia—HOSPITAL—Treas. Dpt. at office Sup. Archt., Wash., D. C., buildings, utilities, roads, walks, grading, at U. S. Veterans Administration Hospital, to W. S. Barstow, 417 Washington St., Reading, Pa., $260,500. Noted Oct. 15.

Texas—DREDGING—U. S. Eng., Galveston, 1,000,000 cu.yd. in channel from Galveston Harbor to Texas City, to Atlantic Gulf & Pacific Co., 15 Park Row, New York, $54,500. Noted Oct. 15.

Tex., San Benito—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, to Meriweather & Sauers, Harlingen, $87,000. Noted Nov. 12 Daily.

Wash., Seattle — FEDERAL BUILDING — Murch Bros. Constr. Co., contractor, Railway Exch. Bldg., St. Louis, Mo., placing 100,000 brick, also stone and terra cotta in U. S. Federal Building, to R. W. Tarp, 610 Taylor Ave., for Treas. Dpt. at office Sup. Archt., Wash., D. C., $250,000. Noted Aug. 19, under "Contracts Awarded."

W. Va., Marmet—LOCKS—U. S. Eng., Huntington, constructing Lock B at Marmet Site, Great Kanawha River, to Dravo Contg. Co., Neville Island, Pittsburgh, Pa., $483,311. Noted Oct. 1.

RAILWAYS

BIDS ASKED

New York—Dec. 12, by New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, relaying tracks, building approaches, for perishable freight yards, as part of general grade crossing elimination project, Syracuse, for Grade Crossing Comrs., State Tower Bldg., Syracuse. $575,000. Noted Apr. 9.

Const. News page 204

CONTRACTS AWARDED

Maryland—Pennsylvania R.R., E. B. Temple, ch. engr. (Eastern Region), Phila., Pa., relocating 3 mi. track, constructing passenger station, 2 bridges, one over Little Elk Creek and other over Carroll Branch, Elkton, to Empire Contg. Co., 31 South Calvert St., Baltimore. Noted Nov. 19.

SUBWAYS AND TUNNELS

PROPOSED WORK

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., program for Bronx Boro, incl. 15.88 track mi. 4 tracks under Alexander Ave., Melrose Ave., Boston Rd. (Harlem River to West Farms) $40,400,000; 7.9 mi., 2 tracks under Morris Park Ave., Wilson Ave. line. (Garfield St. to Boston Rd.) $13,700,000; 10.4 mi. 2 tracks 163rd St., Hunts Point Rd., Lafayette Ave. (3rd to East Tremont Aves.) $12,900,000; 4.3 mi. 2 tracks under Burke Ave., Boston Rd. Line (Webster to Baychester Aves.) $8,900,000. Bd. Estimate approved plans with preliminary work underway. **Maturity late in spring.**

GRADE CROSSINGS

PROPOSED WORK

Mass., Waltham—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, A. W. Dean, engr., and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, preliminary plans completed grade crossing elimination, Beaver Brook, Main St. $500,000.

N. J., Hoboken—State Hy. Comn., Trenton, Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bank Bldg., Cleveland, O., and New York Central R.R. Co.; F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing Willen Dr. $600,000. **Maturity in spring.**

New York—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, eliminating Hampton Road Crossing at Southampton and West Hampton. $175,000.

New York—Public Service Comn., Albany, approved 170 railroad grade crossings to be considered for elimination in 1932; 48 new projects est. $18,771,000 and 122 carried over from 1931 est. $54,067,900.

N. Y., Chili—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating Sand Hill Crossing, Monroe Co. To exceed $40,000.

N. Y., Clymer—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating grade crossing on Clymer-Panama Hy., Chautauqua Co. To exceed $25,000.

N. Y., Mount Pleasant—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing, Commerce Ave. $50,000. **Maturity late 1932.**

N. Y., Mount Vernon—City and New York, New Haven & Hartford R.R. Co., E. E. Oviatt, ch. engr., New Haven, Conn., soon selects engineer to make surveys and estimates of cost for covering railroad cut, 3rd to 6th Aves. $200,000.

N. Y., Pittstown—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., bids in winter general contract eliminating West Street Crossing. To exceed $25,000. Test borings awarded to Gow Co., c/o owner.

N. Y., Potsdam—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, bids in spring, eliminating Sisson Crossing, St. Lawrence Co. To exceed $25,000.

N. Y., Riverhead—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, eliminating grade crossing, Main St. $200,000. **Maturity late 1932.**

N. Y., Wallkill — New York, Ontario & Western R.R. Co., W. C. Heidenthal, ch. engr., Middletown, eliminating grade crossing, Orange Co. To exceed $25,000.

BIDS ASKED

Maryland—Dec. 8, by State Roads Comn., G. C. Uhl, chn., Baltimore, substructure, superstructure (with exception superstructure for span over railroad tracks), approaches, for grade elimination over Baltimore & Ohio R.R., Front St., Cumberland, Contr. A-43-63, Allegany Co.; adv. E.N.-R. Dec. 3.

Mass., Quincy — New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., and City, taking bids abolishing grade crossing, Quincy Adams Crossing, incl. 200 ft. bridge with supporting piers. Noted July 23.

Mo., Jennings—See "Contracts Awarded."

New York, Syracuse—See "Railways under New York."

CONTRACTS AWARDED

Ind., South Bend—Grand Trunk Western R.R. Co., J. A. Heaman, ch. engr., Detroit, Mich., grade separation at Walnut St., to Hamer-Paskins Constr. Co., Chicago, Ill. Est. $500,000. **Maturity early in spring.** This corrects report in Nov. 27 issue under Southbend, Ia.

Mo., Jennings—St. Louis Co. (Clayton) and Wabash R.R. Co., W. R. Bennett, ch. engr., Exchange Bldg., St. Louis, 80 ft. rein.-con. subway, 20 ft. wide, for extending Florissant Ave. under railroad tracks. $25,000. Wabash R.R. will have charge of construction and will do work with own forces.

N. Y., Albany—Delaware & Hudson R.R J. MacMartin, ch. engr., eliminating crossings Bway., Madison Ave., South F Arch, Rensselaer, Mulberry, Schuyler Church Sts., to Booth & Flinn Co., 1942 F St., Pittsburgh, Pa. $888,632. Est. $1,4 195.

N. Y., Valhalla—New York Central R.R F. B. Freeman, ch. engr., 466 Lexington A New York, eliminating grade crossing, 200 north Valhalla Station, to Tuller Constr. 95 Monmouth St., Red Bank, N. J., $104,5 Est. $147,831. Noted Sept. 24.

Pa., Pittsburgh—R. G. Woodside, contro Allegheny Co., Court House removing exis bridge, constructing undergrade crossing McNeilly Rd., at Saw Mill Run, Elwin Statio Baldwin Twp., incl. 1,750 cu.yd. excav., 1,5 cu.yd. concrete, 306 sq.yd. membrane and 3 sq.yd. tar waterproofing, 160 lin.ft. metal saf treads, 2,220 sq.ft. aluminum surface fini 232 lin.ft. handrailing, to F. Kaukurin, 3 Marquette Ct., Wilmerding, $27,913. No Oct. 8.

Wisconsin—State Hy. and Unemployme Comns., State Capitol Annex, Milwauke North Camp Douglas Grade Separation, June Co., to L. G. Arnold, Inc., $1,291; Butler Gra Separation, F.A.P. 349-K, Milwaukee, Co., Marchese Bros., Inc., 435 Clinton St., Milwaukee, $32,648.

DAMS

PROPOSED WORK

Ia., Albia—Iowa State Fish & Game Comn Des Moines, preliminary plans lake 9,600 f long, 800 to 3,000 ft. wide with concrete dam spillway, near Albia and Blakesburg. $75,000 Brown Eng. Co., 108 North Market St., Ottumwa, engrs.

Pa., Jamestown—See "Excavation, Drainag Irrigation, Levees and Harbors."

Pa., Spring Grove—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Mass., Gloucester — PIER — Commonwealth of Massachusetts, Dpt. P. Wks., State Hous Boston, completed preliminary survey fish pie from Mainland to Five Pound Island. $683,000 F. L. Sellew, State House, Boston, engr. Noted Apr. 23.

N. Y., Port Richmond—PIER—Reading R.R Co., C. Dillenbeck, ch. engr., Reading Terminal Phila., Pa., reconstructing Pier 11, damaged by fire. $150,000. **Maturity after Jan. 1.**

CONTRACTS AWARDED

Mass., Harwichport—PIER, etc.—W. Brown 36 Lime St., Boston, concrete pier, boat hous to F. Crowell, Harwichport. Est. $15,000.

N. J., Hoboken—PIER—Lamport & Holt Ltd., W. H. Davies, in charge, foot 15th St rebuilding Pier 16, rein.-con., steel, destroyed by fire, to Tilt-Hargan Co., 90 West Bway., New York. Est. $25,000 or more.

N. B., St. Andrews—WHARF—Dpt. P. Wks., K. M. Cameron, engr., Ottawa, reconstructing wharf, to La Forest Robinson & Co., St. Stephens, $21,000.

AIRPORTS

CONTRACTS AWARDED

Pa., Bloomsburg — Bloomsburg Airport, 1 story, 10-plane capacity hangar, to Dresser Co., 1085 The Arcade, Cleveland, O., $40,000.

POWER AND LIGHTING

PROPOSED WORK

Ill., Wilmette—City Council, C. M. Osbo mgr., street lighting system west of Ridge Ave. $100,000. F. A. Gurdes, 127 North Dearborn St., Chicago, engr.

Mo., University City — Bd. Aldermen, received plans, specifications from Wells Eng. Co., Inc., Security Bldg., St. Louis, street lighting system, initial expenditure $206,000, total $466,150.

BIDS ASKED

Mo., Kirkwood—See "Contracts Awarded."

CONTRACTS AWARDED

Mo., Kirkwood — Union Electric Light & Power Co., 12th and Locust Sts., St. Louis, will install secondary electric line from downtown section to junction Geyer and Dougherty Ferry Rds., own forces.

N. Y., New York—E. P. Mulrooney, police comr., 240 Center St., signal posts, Bway., Manhattan Boro, to L. I. Wladman, 241 East 36th St., $13,900; on Madison Ave., Manhattan Boro, and Bridge Plaza, Queens Boro, to Pyramid Electric Co., 228 East 41st St., $7,100 and $4,500 respectively. Grand total $25,500. Noted Nov. 12.

PARKS AND SPORTS

PROPOSED WORK

N. J., Helmetta—Bd. Boro Council, Boro Hall, concrete, tile swimming pool. $25,000. Engineer not appointed. **Maturity indefinite.**

N. Y., Corona—Bd. Educ., 500 Park Ave., New York, playground, 32nd Ave. and 90th Rd. $125,000.

N. Y., Jamaica—Dpt. Parks, W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, park, Grand Central Parkway, 165th and 168th Sts. $10,000,000. Part of program. Noted Oct. 15 under "New York, N. Y."

N. Y., North Castle—Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, 3 acre park and park improvements. To exceed $25,000.

BIDS ASKED

N. J., Avon-by-the-Sea—Bd. City Comrs. bids about Feb. 1, general contract 1 story bathing group. $150,000. J. W. Baker, 111 North 4th St., Harrison, archt. Noted Nov. 19.

N. Y., New York—Dec. 8, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, masonry wall and fence, improving adjacent area along Bronx Park East, at easterly boundary New York Botanical Gardens, Bronx Boro.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., bids about Jan. 1, general contract 75 x 100 ft. public baths, 165 East 120th St. $450,000. C. B. Meyers, 31 Union Sq., archt. Noted Nov. 12.

N.Y., West New Brighton—Dec. 7, by W. C. Martin, archt. and Supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, retaining walls, grading, paving, plumbing, drainage, for playground adjoining P.S. 18, Market St., from Bway. to Campbell Ave., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

Mass., Boston—City, Park Dpt., reconstructing Wm. Amerena Playground, grading, walks, bleachers, East Boston, to A. G. Tomasello, 250 Stuart St. Est. $25,000.

Mass., Canton — Commonwealth of Massachusetts, Metropolitan Dist. Comn., Boston, 1 story, brick locker at Blue Hill Reservation, to Corsetti & Arcese, 432 Watertown St., Newton. Est. $25,000.

Mass., Quincy—M. Pearl, c/o Hendrick & Haywood, archts., 192 Boylston St., Boston, 1 story, 135 x 145 ft., timber, brick open air dance pavilion, concrete found., Southern Artery and Canal St., to E. C. Sargent, 15 Saville St. Est. $25,000.

N. Y., Port Richmond—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, grading Faber Park, to J. V. Pedersen Inc., 20 Kingsley Ave., Port Richmond $17,272; wading pool, to Hold Constr. Co. Grand Central Terminal, New York, $91,694. Noted Nov. 12.

HEATING AND VENTILATING

PROPOSED WORK

N. J., Princeton—Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, Mass., heating, plumbing, electrical work for animal and plant pathology laboratory, for Rockefeller Institute, York Ave. and 66th St., New York. Noted Nov. 19, under "Buildings-Unclassified."

BIDS ASKED

N. Y., Rosedale—Dec. 8, by W. D. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work and lighting fixtures in P. S. 138, Weller Ave. from Caney Lane to 253rd St. for Bd. Educ., 500 Park Ave., New York.

Pa., Phila.—Dec. 7, by C. E. Myers, dir. Bd. P. Wks., City Hall Annex, altering heating system for East Side City Hall. Contr. 255.

CONTRACTS AWARDED

N. Y. New York—Bd. Higher Educ., at office Secretary Hunter College, Park Ave. and 68th St., heating and ventilating for gymnasium at Hunter College, to G. E. Gibson Co., 441 Lexington Ave. Est. $95,000. Noted Sept. 3.

UNCLASSIFIED

PROPOSED WORK

D. C., Wash.—MEMORIAL—Roosevelt Memorial Assn., 28 East 20th St., New York, plans Roosevelt Memorial on Analostan Island, in Potomac River, near here. To exceed $1,000,000. John Russell Pope, 542 5th Ave., New York, archt.

Ia., Des Moines—RADIO STATION—Central Broahcasting Station WHO., Liberty Bldg., remodeling Stoner Building into broadcasting station, installing equipment, 912 Walnut St. $100,000.

Mass., Revere—OIL STORAGE PLANT—Boston Port Development Co., W. J. MacDonald, pres., 1 Court St., Boston, sketches oil storage plant, incl. 29 steel storage tanks, earth dykes, garages, repair shop, warehouse, Chelsea Creek. $3,000,000. Private plans. Noted June 25.

N. J., Asbury Park — DANCE HALL — R. DuPreer, 1920 Corlies Ave., Neptune City, plans by E. Worth, 207 Market St., Newark, 2 story, basement, brick, steel dance hall, pool parlor, Spring St. $150,000. Noted Nov. 19.

N. J., Jersey City—COAL POCKET—W. Neuman, archt., 26 Journal Sq., rejected bids general contract 1 story, brick, rein.-con., for Jersey City Coal Co., 374 Newark Ave. $40,000. Noted Sept. 24.

N. Y., Brooklyn—COMFORT STATIONS—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, 10 or more comfort stations.

N. Y., New York—ELEVATORS—Empire State, Inc., 350 5th Ave., bank of 26 elevators to serve from basement to 1st floor in office building 5th Ave. and 34th St. $75,000. Shreve, Lamb & Harmon, 11 East 44th St., archts.

Texas and Louisiana—PIPE LINES—Tex-York Utilities Corp., c/o Sinclair Refining Co. of Louisiana, Meraux, La., 400 mi. pipe lines from East Texas to Meraux, La. $10,000,000.

Tex., Beaumont—OIL PIPE LINE—Yount-Lee Co., c/o F. M. Yount, Beaumont, soon lets contract 45 mi. 10 in. welded c.i. oil pipe line from High Island to the water terminal of company. $500,000. Pipe already purchased. Private plans.

Tex., Corsicana—STORAGE TANKS—Magnolia Petroleum Co., four 80,000 bbl. storage tanks. $58,000.

BIDS ASKED

N. Y., Flushing—COMFORT STATION—Dec. 8, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, erecting, completing comfort station, Flushing Park. Noted Sept. 10.

N. Y., New York—PAVILION—Dec. 10, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., general contract, heating, plumbing, ventilating for alterations to West Pavilion, New York City Children's Hospital, Randalls Island.

CONTRACTS AWARDED

Mass., Boston — TOWER — New Old South Congregational Church, R. H. Stafford, 645 Boylston St., rebuilding steel, stone church tower, 246 ft. high, Boylston and Dartmouth Sts., to Casper Range Constr. Co., 136 Newbury St., Boston. Est. $50,000.

Mass., Newton—SUB-BASEMENT—City, F. S. Weeks, mayor, concrete sub-basement under Junior High School, Rowena Rd., to R. A. Vachon, 22 Union St., Newton Centre. Est. $25,000.

Mass., Quincy—OIL TANK TERMINAL, etc. —New England Terminal Co., 46 Bates Ave., oil tank terminal, incl. 32 storage tanks, garage, office, wharf, sidings, Montclair Sect., Quincy side of Neponset River, to Cross & Roberts, Inc., Statler Bldg., Boston. Est. $2,000,000. Noted Oct. 29.

Mich., Dearborn—BLAST FURNACE—Ford Motor Co., reconstructing, enlarging and modernizing blast furnace at plant, to Arthur McKee & Co., 2422 Euclid St., Cleveland, O. Est. $160,000.

New York—PIPE LINE—Lycoming Natural Gas Co., Penn Yan, 15 mi. gas pipe line from Wayne field to Penn Yan, to Rich & Co., Bradford, Pa.

N. Y., Brooklyn—STATION FINISH—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, station finish for underground rectifier stations on Route 107, Sect. 6, Route 110, Sects. 1 to 4 (inclusive), to Eastern Constr. Co., 110 West 40th St., New York, $5,723. Noted Nov. 12.

N. Y., Long Island City—STATION FINISH WORK—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, station finish work for Elmhurst and Grand Ave.—Newton Stations of Rapid Transit R.R., to Peter Reiss Constr. Co., 186 Remsen St., Brooklyn, $137,505. Noted Nov. 5.

N. Y., New York—SCALE BOX, etc.—Cullen Fuel Co., 192 Lexington Ave., 2 story, 30 x 100 ft. scale box and office, coal yard, to Nicholson Co., 405 Lexington Ave. Est. $40,000. Noted Nov. 12.

Texas—GAS PIPE LINE—United Gas Pub. Serv. Co., Longview, 30 mi. 4 in. c.i. welded joint natural gas pipe line to supply suburban areas Longview, Gladewater, Henderson Tanneyville, Turner town, Camp Switch. $150,000. Owner builds. Private plans.

Tex., Longview—TANKS—East Texas Refining Co., Longview, Tex. and Tulsa, Okla., two 80,000 bbl. steel horizontal tanks, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill.

N. Y., Pine Aire Station—ELEVATORS—Dpt. Mental Hygiene, State Office Bldg., Albany, elevators at Pilgrim State Hospital, to Otis Elevator Co., 130 Clinton St., Brooklyn. $77,643.

MATERIALS

PROPOSED WORK

GRAVEL—**Eureka, Calif.**—City, A. W. Kildale, city clk., purchasing 1,000 cu.yd. or more gravel.

STEEL, etc.—**Trenton, N. J.**—E. J. Quigley, state purch. agt., rejected bids Nov. 12, auto license tag steel and tag coating materials. $56,000. Will readvertise. Noted Oct. 29.

BIDS ASKED

ROAD OIL—**Merced, Calif.**—Dec. 15, by P. T. Thornton, clk. Merced Co., 15,000-30,000 bbl road oil.

CONCRETE, etc.—**Shelbyville, Ind.**—Dec. 8, by Bd. City Comrs., 50 tons emulsified asphaltic concrete, 5 bbl. emulsified asphalt, 8,000 gal. Tarvia, Grades A, B, X, T, C, M, KP, XC. $5,000. G. A. Parrish, Shelbyville, aud.

SEWER PIPE, GRADER BLADES, etc.—**Shelbyville, Ind.**—Dec. 10, by Bd. City Comrs., 12- to 36-in. corrugated metal sewer pipe, road drags, drag blades, grader blades, creosoted bridge, flooring. $5,600.

LUMBER, etc.—**Cedar Rapids, Ia.**—Dec. 10, at office Auditor Linn Co., 35,000 ft. B.M. creosoted bridge lumber, 44,000 ft. B.M. untreated bridge lumber, 2,300 lin.ft. creosoted yellow pine piling. Address County Engineer or Auditor.

CULVERT PIPE, BRIDGE PLANK, etc.—**Cresco, Ia.**—Dec. 10, at office Auditor Howard Co., 5,600 lin.ft. corrugated culvert pipe various sizes, 96,000 ft. B.M. creosoted yellow pine bridge plank, 10,000 ft. B.M. creosoted yellow pine bridge caps, 3,800 lin.ft. creosoted yellow pine piling, 120,000 ft. B.M. untreated Douglas fir bridge plank, 8,000 ft. B.M. finished lumber Class C. Address County Engineer or Auditor.

RIP RAP, etc.—**Harwich, Mass.**—Dec. 8, by Dpt. P. Wks., Boston, furnishing, placing 1,000 tons rip rap and chips for 4 stone jetties at West Harwich. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

STEAM CINDERS—**Brooklyn, N. Y.**—Dec. 9, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, 5,000 cu.yd. steam cinders.

STRUCTURAL STEEL—**Phila., Pa.**—Dec. 8, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 North 32nd St., Contr. 31, 1931, structural steel.

SEWER BRICK, etc.—**Providence, R. I.**—Dec. 7, by City, City Clerk, quantities hard burnt sewer brick, commercial building brick, sewer pipe.

CONTRACTS AWARDED

CRUSHED STONE—**Hartford, Conn.**—City, Bd. Contr. & Supply, 41,500 tons annually ¼ in., ½ in., 1 in. and 2 in. crushed stone for 2 years to Edward Balf Co., 14 Haynes St. $121,000.

BRIDGE LUMBER — **Creston, Ia.** — Bd. Supervs. Union Co., 220,000 ft. untreated and $70,000 ft. creosoted bridge lumber, to G. A. Field, 522 Liberty Bldg., Des Moines, $9,133, and to Southern Wood Co., Atlanta, Ga., $3,500. Noted Oct. 22.

STONE—**Maine**—State Hy. Dpt., Augusta, furnishing, hauling stone as specified to cities of Casco and Portland, to E. S. Jordan, Mechanics Falls, at $0.70 per cu.yd. Est. $25,000. Noted Nov. 19.

WIRE—**Minneapolis, Minn.**—F. S. Gram, city purch. agt., 23 mi. No. 10 copper-clad, weatherproof wire, 40 per cent conductivity for police signal system, to Northland Electric Supply Co., 309 South 5th St., at $18.70 per hundred-weight. Noted Nov. 12.

PIPE—**Scarsdale, N. Y.**—Village, c.i. water pipe for main in Fenimore Rd., to Warren Fdry. & Pipe Co., 11 Bway., New York, $12,180.

CAST IRON PIPE—**Yoakum, Tex.**—Broussard-Warfield Co. (general contractors), Beaumont, furnishing 2,500 tons 1- to 10-in. c.i. pipe, to McWane Cast Iron Pipe Co., 1201 Vanderbilt Rd. N., Birmingham, Ala. Noted Oct. 29, under "Waterworks, Contracts Awarded."

EQUIPMENT

BIDS ASKED

TRUCK—**Beverly Hills, Calif.**—Dec. 8, by B. J. Firminger, city clk., 16,000 lb. gross capacity rubbish dump truck.

SAND WASHING MACHINE—**Hartford, Conn.**—Dec. 7, by Bd. Contr. & Supply, R. Dillon, clk., Contr. 7, sand washing machine delivered to Water Bureau Filter Plant, West Hartford; Contr. 8, portable air compressor delivered to Water Bureau, Union St. Yard.

FRAMES and COVERS—**Boston, Mass.**—Dec. 8, by Supply Dpt., $100,000 lb. frames and covers to Water Service. P. A. Chapman, supt.

PUMP, MOTOR, etc.—**Palmer, Mass.**—S. C. S. Box Co., Palmer, in market pump, 110 v. motor and vented receiver with float switch for returning condensation to boiler about 4,000 ft. radiation, 2 steel smokestacks, 20 in. x 40 ft. each.

GASOLINE ENGINE—**Bay St. Louis, Miss.**—Dec. 21, by Mayor, furnishing material, labor, equipment for removing present electric motor and installing gasoline engine with all accessories.

GRADER—**Las Vegas, Nev.**—Jan. 5, by W. L. Scott, clk., Clark Co., 4 or 6 cylinder tractor type motor.

CONTRACTS AWARDED

INDUCTION REGULATORS—**Modesto, Calif.**—C. S. Abbott, secy. Modesto Irrigation Dist., furnishing, delivering 3 out-door induction regulators, to General Electric Corp., Russ Bldg., San Francisco, $5,264. Noted Oct. 29.

VALVES, etc.—**San Francisco, Calif.**—Bd. P. Wks., S. K. Hester, secy., City Hall, 2 automatic synchronous stop and relief valves and 1 automatic pressure valve, to Pelton Water Wheel Co., 2929 19th St., $18,300 and $5,210 respectively; 60 in. Butterfly Valve, to Joshua Hendy Iron Wks., 200 Pine St., $3,950. Grand total $27,460. Noted Oct. 29.

Constr. News page 265

HYDRANTS and GATES—**Boston, Mass.**—City, Dpt. P. Wks., J. A. Rourke, comr., hydrants, gates as specified, to McCulloch Mfg. Co., 200 Old Colony Ave., South Boston, $7,327.

FOREIGN

Czechoslovakia, Prague—Ministry of Public Wks. plans road program for 1932. $22,000,000.

England—Canton Rubber Co., 211 7th St., Canton, O., plans rubber glove factory branch in Leeds or Manchester. Location not decided. F. J. Wilson in charge.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Mass., Boston—See "Contracts Awarded."

Mass., Dorchester (br. Boston)—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Long Island City—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., West New Brighton—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Boston—Arborway Realty Co., 7 Water St., 3 story, basement, irregular sized, brick, stone, steel, concrete found., Morton St. and Arborway, Forest Hills, separate contracts, $600,000. Winebaum & Wexler, 73 Cornhill, archts.

Mass., Dorchester (br. Boston)—M. Louis, archt., 73 Cornhill, Boston, 4 story, basement, brick, stone, steel, plain found., 527 Talbot Ave., separate contracts for Owner, c/o architect. $160,000.

N. Y., Brooklyn—Auglun Operating Co., c/o F. A. Lindquist, 1516 Emmons Ave., 6 story, East 15th St. and Emmons Ave., separate contracts. $250,000. E. Falkenhainer, 1958 East 13th St., archt.

N. Y., Brooklyn—B. Kushel, 7016 Bay Parkway, 6 story, basement, 84x150 ft. apartment, store, Bay Parkway and 71st St., separate contracts. $325,000. H. Hurwitt, 131 West 38th St., New York, archt.

N. Y., Brooklyn—LeSoleil Apartment, inc., c/o G. V. McPherson, 2047 Nostrand Ave., 6 story, 90 x 105 ft., East 29th St. and Avenue J separate contracts. To exceed $150,000. J. Marline, 545 5th Ave., New York, archt.

N. Y., Long Island City—F. Soviero, 192nd St., Hollis, apartment, Orville St. and Metropolitan Ave., separate contracts. $150,000. Private plans.

N. Y., New York—Audubon Park Building Corp., 12 East 41st St., 6 story, 763 Riverside Dr., separate contracts. $600,000. A. E. Schaefer, 2408 Grand Concourse, archt.

N. Y., New York—W. F. Chatlos, 369 Lexington Ave., 12 story, basement, brick, 139 East 39th St., separate contracts. L. Knust, 369 Lexington Ave., archts. **Maturity soon.**

N. Y., West New Brighton—Rosjen Land Co., c/o W. S. E. Hall Co., 26 Bay St., St. George, 5 story, basement, brick, steel, Hart Blvd., separate contracts. $150,000. Private plans.

CLUBS

PROPOSED WORK

N. J., Jersey City—Owner, c/o Kelly & Gowan, archts., 921 Bergen Ave., sketches 2 story, basement, brick, steel club house. $150,000.

N. J., Paterson—Workmen's Circle Labor Lyceum Corp., c/o Goodman, & Shulman, archts., 20 Smith St., rejected bids Oct. 1, general contract 2 story, basement, brick, steel club house, Carroll St. and 12th Ave. $150,000. Noted Oct. 1.

N. J., Ridgewood—Y.M.C.A., 112 Oak St., sketches by C. C. Wendehack, 101 Park Ave., New York, 3½ story, basement, brick steel building. $150,000. Noted Nov. 26.

N. Y., New York—Women's National Republican Club, 18 East 48th St., club, 3 West 51st St. F. R. King, 8 East 37th St., archt.

BIDS ASKED

Mass., Brockton—See "Contracts Awarded."

Mass., Falmouth—Dec. 12, by Building Com. Marine Lodge Free and Accepted Masons, 3 story, basement, 60 x 100 ft., brick stone, steel masonic temple, stores, plain found., Main St., $150,000. J. G. Hutchinson, 10 Norwell St., Denham, archt. Noted Nov. 26.

Mass., Newton—Newton Lodge of Elks, 492 Centre St., taking bids altering and constructing 2 story, basement, brick, lodge room and store, addition, plain found. $150,000. C. S. J. White, 825 Beacon St., Newton Centre, archt. Piers and Wharves

CONTRACTS AWARDED

Mass., Brockton—Corporation, c/o Novelle Ermete Club, 158 Main St., clubhouse, Green St., separate contracts. $150,000. D. Levy, 415 Lexington Ave., New York, archts.

Constr. News page 206

HOSPITALS

PROPOSED WORK

N. J., Orange—New Jersey Orthopaedic Hospital & Dispensary, 179-81 Lincoln Ave., sketches by York & Sawyer, 100 East 42nd St., New York, hospital addition. $150,000. **Maturity early in January.** Noted Oct. 1.

N. Y., New Dorp—Seaside Hospital, 3 story, basement, 50 x 150 ft., brick, steel dormitory, plain found. $200,000. Project in abeyance. Noted Aug. 20, under "Contracts Awarded."

N. Y., New York—Mount Sinai Hospital, 5th Ave. at 10th St., altering and constructing 5 story, 54 x 100 ft. dispensary incl. drug room, freight elevators and bridge over court, 101st St., 5th and Madison Aves. $150,000. Gehron & Ross, 101 Park Ave., archts.

BIDS ASKED

Calif., Los Angeles—Dec. 8, by A. C. Martin, archt., 228 Higgins Bldg., 10 story, basement, concrete, steel hospital, 2301 Bellevue Ave., for Queen of Angels Hospital, 2301 Bellevue Ave. $275,000. Noted Sept. 17.

Conn., Waterford—Seaside Sanatorium State Tuberculosis Comn., Hartford, bids about Mar. 1, general contract hospital, $150,000. Cass Gilbert, 244 Madison Ave., New York, archt. Noted Sept. 3.

Mich., Lapeer—Dec. 8, by Michigan State Administrative Bd., G. R. Thompson, budget dir., 212 State Office Bldg., Lansing, 2 story, basement, brick, rein.-con. hospital for tuberculosis unit, plain found., Training School Grounds. $150,000. Maul & Lentz, 1259 David Whitney Bldg., Detroit, archts.

N. J., Jersey City—Bd. City Comrs., City Hall, bids about Feb. 1, 3 laboratories and 2 hospital buildings, 4 and 5 story, basement, brick, steel Medical Center. $5,000,000. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted Oct. 1

N. Y., New York—Dec. 9, by J. G. W. Greeff, comr. Hospitals, Municipal Bldg., erecting, completing dormitory for male employees, Metropolitan Hospital, Welfare Island. M. Bernstein, 2 Columbus Circle, archt. Noted June 11.

N. J., Scotch Plains—Bd. Freeholders Union Co., Court House, Elizabeth, bids about Dec. 23, 2 story basement, brick, steel, sanitorium addition, Bonnie Brae Sanitorium. $150,000. Oakley & Son, 1259 Clinton Pl., Elizabeth, archts. Noted Sept. 24.

R. I., Pawtucket—Memorial Hospital, Prospect St., plans by Monahan & Meikle, 285 Main St., and takes bids about Dec. 2, 3 story, basement, brick dormitory, plain found., Prospect St. $150,000 or more. Noted Nov. 5.

CONTRACTS AWARDED

Mass., Boston—Massachusetts Memorial Hospital, 82 East Concord St., reconstructing Robinson Memorial Building, 4 story, basement, brick, steel, plain found., 6 Stoughton St., to Arlington Constr. Co., 691 Mass. Ave., Arlington. Est. $150,000. Noted Nov. 12.

CHURCHES

PROPOSED WORK

Conn., New Haven—First Methodist Episcopal Church, C. Scott, chn. Plans Com., G. S. Lackland, pastor, plans by Sendt & Wenner, Methodist Episcopalian Bureau of Architecture, 1701 Arch St., Phila., Pa., brick, stone church, College and Elm Sts. $250,000. Noted Nov. 26.

Me., Winthrop—St. Francis Xavier Society, J. McGowan, pastor, sketches by J. J. O'Shaughnessy, 80 Boylston St., Boston, 1 story, brick church. $150,000.

Mass., Winchester — Immaculate Conception Roman Catholic Church, J. F. Fitzsimmons, pastor, 928 main St.; chapel, Sheridan Circle. $150,000 or more. Architect not appointed.

N. J., Paterson—T. J. Folks, archt., 488 East 33rd St., altering and constructing 2 story, basement, brick, steel church addition, Marshall St., for St. Ann's Church, C. A. Anid, pastor, 235 Mill St. $150,000. Noted Nov. 12.

N. J., Plainfield—Crescent Avenue Presbyterian Church, J. J. Monent, pastor, 720 Watchung Ave., rebuilding 2 story, basement, brick, steel, East 7th St., Watchung and Crescent Aves., destroyed by fire. $150,000.

N. J., Pleasantville — Memorial Futurist Church of God and Jesus Christ His Son, S. C. Martin, trustee, 2 story, basement, brick, steel, New Rd. and Wellington Ave. $150,000. **Maturity soon.**

N. Y., Brooklyn—Roman Catholic Diocese of Brooklyn, A. T. Peadilla, secy., 75 Greene Ave., sketches by J. F. Cook, 375 Fulton St., 4 story, 191 x 196 ft. school, Vanderbilt and Greene Aves. $750,000.

R. I., Pawtucket—St. Martin's Mission, W. T. Townsend, pastor, 145 Hughes Ave., sketches by Howe & Church, Turks Head Bldg., Providence, 1 story, basement, brick, stone church, Hughes and Newport Sts. $150,000.

BIDS ASKED

N. J., Glen Ridge—Guilbert & Betelle, archts., 20 Branford Pl., Newark, bids about Jan. 15, general contract 2 story, basement, brick, steel church, Sunday school, for Glen Ridge Congregational Church, Ridgewood Ave. $150,000. Noted Sept. 10.

N. J., Summit—Cady & Gregory, archts., 40 West 32nd St., New York, taking bids general contract 3 story, basement, brick, steel church, tower, for Owner c/o architects. $150,000.

N. J., Secaucus—Congregation Anshe Solem, J. Pollack, in charge, 71 2nd St., bids about Feb. 1, general contract 2 story, basement, brick, steel temple, Roosevelt Ave. and 3rd St. $150,000. Private plans. Noted Nov. 12.

Pa., Elmhurst—F. F. Dureng, archt., 1 West Dudley Ave., Westfield, N. J., bids abo Jan. 15, general contract 3 story, basemen 50 x 100 ft., brick, steel mother house, pla found., for Poor Sisters of Jesus Crucified a The Sorrowful Mother. $150,000.

CONTRACTS AWARDED

N. J., West New York—Church of Madon Della Libera, L. Borgetti, pastor, 4946 Huds Blvd., general contract altering and constructi 2 story, basement, brick, steel chapel additio Hudson Blvd. and 13th St., to J. J. Mario Inc., 685 Robert St., North Bergen. E $150,000.

SCHOOLS

PROPOSED WORK

Conn., Greenwich—Town, E. C. Andrews, supt. schools, bids late in January, 2 story, brick, rein.-con., steel, Riverside School Easter Sect., Hendrie Ave. $275,000. W. F. Dominick Stanwich Rd., Greenwich and 19 West 44t St., New York, archt. Nov. 12.

Conn., Storrs—Connecticut Agricultural College, C. C. McCracken, pres., plans by Perry & Bishop, 17 Court St., New Britain, and takes bids in spring, brick, steel economics unit $250,000.

Me., Waterville—Colby College, F. W. Johnson, pres., plans by J. F. Larson, Hanover, N. H., college group. $3,000,000. Preliminary work now going ahead. Noted Aug. 20.

Mass., Haverhill—Sacred Heart Roman Catholic Church, J. F. Kelleher, pastor, 6 Carlton Ave., 2 story, basement, brick, stone, steel school, plain found., Doane St. $150,000. J. G. Flaherity Green Harbor, Mansfield, archt. Noted Oct. 22.

Mass., Weymouth — Town, P. T. Pearson, supt. schools, 2 story, basement, brick school at Weymouth Heights. $150,000. Architect not appointed.

N. H., Exeter—Phillips Exeter Academy, L. Perry, principal, sketches by Cram & Ferguson, 248 Boylston St., Boston, Mass., Dormitory 7, 4 story, brick, limestone. $150,000 or more.

N. J., Bayonne—St. Mary's Church, W. Lawlor, dir. Education, Newark Diocese, 326 Avenue C, revised sketches by F. F. Durang, 110 West Dudley Ave., Westfield, 3 story, basement, brick, steel high school. $200,000.

N. J., Fair Lawn—Bd. Educ., Boro Hall, 2 story, basement, brick, steel school, Lyncrest Manor. $150,000. Architect not appointed. **Maturity indefinite.**

N. J., Hasbrouck Heights—Bd. Educ., M. Hitchcock, supt., Administration Bldg., sketches by F. Lansing, 50 Washington Pl., 2 story, basement, brick, steel addition to Euclid School, Passaic Ave. $150,000.

N. J., Jersey City—Bd. Educ., Administration Bldg., revised sketches by J. T. Rowland, Jr., 30 Journal Sq., Jersey City, Senior High School, and takes general contract bids about Feb. 1, 4 story, basement, brick, steel, rein.-con. $2,000,000. Noted Sept. 3.

N. J., Jersey City—St. Peter's College, J. S. Dineen, pres., 144 Grand Ave., 10 story, basement, 110 x 130 ft., brick, rein.-con. steel college, Gicord Ave. and Lincoln Park. $750,000. Noted Oct. 29.

N. J., Livingston—Bd. Educ., Township Hall, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel addition, Roosevelt School. $150,000. Noted Sept. 10.

N. J., Montclair—Bd. Educ., 32 Valley Rd., rejected bids Nov. 10, altering and constructing Hillside School, 1 story, basement, brick, steel, Orange Rd. and Hillside Ave. $150,000. Starrett & Van Vleck, 393 7th Ave., New York, archts. Noted Nov. 5.

N. J., Mountain View—Bd. Educ., H. Campbell, building comr., 2 story, basement, brick, steel, French Hill and Valley Rd. $150,000. Architect not appointed. **Maturity soon.** Noted June 4.

N. Y., New York—Bd. High Educ., Hunter College, Park Ave. and 68th St., plans by Thompson, Holmes, Converse & Meyers, 101 Park Ave., 5 story college, Bedford Park Blvd and Navy Ave. $4,500,000.

N. Y., New York—Columbia University, Bway. and 116th St., social sciences building for Dpt. Economics. To exceed $250,000. **Maturity indefinite.**

N. Y., Seaford—Bd. Educ. sketches by Knappe & Morris, 171 Madison Ave., New York school. $150,000.

N. Y., West Hampton—Bd. Educ. rebuilding school. $275,000.

O., Oberlin—Oberlin College, c/o E. Hatch Wilkens, pres., Oberlin, plans by Cass Gilbert, 244 Madison Ave., New York, Hall Memorial Building $1,000,000, heating plant $300,000.

Tex., Longview—Bd. Educ., c/o Secretary, plans by M. Lemon, 1910 Petroleum Tower Bldg., Dallas, High School. Noted Oct. 22.

BIDS ASKED

Conn., Greenwich—Bids about Dec. 15, by Town, Bd. Educ., J. W. Curtis, chn., grade school addition, incl. gymnasium, auditorium, library. $180,000. Wm. B. Tubby, 475 5th Ave., New York, archt. Noted Sept. 24.

Del., Bellefonte — Dec. 30, by Delaware School Foundation, Du Pont Bldg., Wilmington, 2 story, basement, 203 x 266 ft., brick, rein.-con. grade and high school, plain found. $300,000. E. W. Martin, 4082 Du Pont Bldg., Wilmington, archt.

Schools (Continued)

Mass., Brookline—Town, E. R. Coverly, supt. schools, taking bids 2 and 3 story, basement, irregular sized, brick, steel high school addition, plain found., Greenough St. and Lowell Rd. $300,000. Kilham, Hopkins & Greeley, 9 Park St., Boston, archts. Noted Aug. 22.

N. J., Hawthorne — Bd. Educ., Lafayette School, bids about Jan. 15, 2 story, basement, brick, steel high school, Central Tract. $475,000. Fanning & Shaw, 40 Ward St., Paterson, archts. Noted Nov. 5.

N. J., Jersey City—Bd. Educ., Administration Bldg., bids about Feb. 1, 2 story, basement, brick, steel truants school, rear of Normal School. $150,000. J. T. Rowland, 30 Journal Sq., archt. Noted Nov. 12.

N. J., Lodi—Bd. Educ., A. Cody, pres., Union St., bids about Jan. 1, general contract on revised plans Junior and Senior High School, 2 story, basement, 140 x 230 ft., rein.-con., brick, steel, Westewell Pl., 1st and Park Sts. $340,000. F. Pirrone, 104 Midland Ave., Garfield, archt. Noted Sept. 3.

N. J., Madison—Bd. Educ., G. F. Sutherland, pres., High School, bids about Jan. 15, general contract 2 story, basement, brick, steel, rein.-con., Kings Rd. $250,000. Guilbert & Betelle, 20 Branford Rd., Newark, archts. Noted Nov. 19.

N. J., Maywood—Bd. Educ., Municipal Bldg., bids about Dec. 15, 2 story, basement brick, steel, addition to School 1, Maywood Ave. $150,000. G. Recke, 221 Prospect Ave., archt.

N. Y., Middleburg—Bd. Educ. bids about Dec. 15, general contract school. $350,000. A. F. Gilbert, 358 5th Ave., New York, archt. Noted Nov. 19.

Pa., Scranton—Scranton School Dist., Administration Bldg., bids about Jan. 24, 3 story, brick, steel, concrete found. $1,500,000. T. Williams, Scranton Life Bldg., archt. and engr.

CONTRACTS AWARDED

Calif., Berkeley—Regents of University of California, general contract 2 story, mens gymnasium building, Class A steel, concrete, to Dinwiddie Constr. Co., Crocker Bldg., San Francisco, $418,000; electrical work, to Turner Co., 329 Tehama St., San Francisco, $30,474; heating, to Alta Electric & Mfg. Co., 938 Howard St., San Francisco, $109,697; plumbing, to F. W. Snook, 596 Clay St., $75,626. Grand total $633,796. Noted Oct. 29.

Conn., Stamford—City, School Bd., 2 story, basement, 90 x 100 ft., brick, steel addition to Rice Junior High School, to Accardi & Son, 408 Central Ave., Bridgeport. Est. $200,000. Noted Nov. 5.

Del., Delaware City—State School Building Comn., H. V. Holloway, supt., Dover, general contract altering and constructing two 1 story, basement, wings, one 60 x 180 ft., one 40 x 40 ft. and 25 x 55 ft. brick, steel high school, plain founds., to P. Lenze, 28 Yale Rd., Audubon, N. J.; plumbing and heating, to T. T. Welden & Son, 916 Orange St., Wilmington; electrical work, to Arrow Electrical Co., 5112 Whitby Ave., Phila., Pa. Est. $150,000. Noted Nov. 12.

Del., Newark—State School Building Comn., H. V. Holoway, pres., Du Pont Bldg., Wilmington, general contract 1 story, basement, 120 x 130 ft., brick, steel addition, plain found., to Wm. M. Francis, Du Pont Bldg., Wilmington; heating and plumbing, to B. F. Shaw Co., 2nd and Lombard Sts., Wilmington; electrical work, to Arrow Electric Co., 5112 Whitby Ave., Phila., Pa. Est. $150,000.

Ind., Connersville—Bd. School Comrs., general contract 2 story, basement, brick, steel high school, 19th St. and Grand Ave. to Insley Mfg. Co., 801 North Olney St., Indianapolis. Est. $150,000. Noted Nov. 5.

Md., Annapolis—Buckler & Fenhagen, archts., 325 North Charles St., Baltimore, 2 story, basement, brick, hollow tile, steel, concrete high school for Anne Arundel School Bd., State House, to J. H. Miller, Eutaw and Franklin Sts., Baltimore, $272,000. Noted Nov. 19.

N. J., West Orange—Bd. Educ., High School, steel and iron for 3 story, 100x225 ft. Junior High School, to Breen Iron Wks., 272 Badger Ave., Newark. This corrects report in Nov. 19 issue.

N. Y., New York—Bd. Educ., 500 Park Ave., general contract P. S. 85, to H. R. H. Constr. Co., Greenwich Ave. and Christopher St., $643,000. Noted Oct. 22.

O., Cincinnati—Bd. Educ., 511 West Court St., Bond Hill School, 2 story, basement, 167 x 250 ft., brick, rein.-con., plain found., to Penker Constr. Co., 1030 Summer St. Noted Oct. 1.

THEATRES

CONTRACTS AWARDED

Calif., Long Beach—United Artists Theatres of California, 931 South Bway., Los Angeles, completing 100 x 145 ft., rein.-con, to J. Wesley Forderer, 742 Hill St., $118,000. Former contract rescinded. Noted Aug. 6.

Mass., Gloucester—J. D. Bloomberg, 83 Main St., Gloucester, 1 story, basement, brick, stone, rein.-con., steel theatre, store, concrete found., 238 Main St., to G. B. H. Macomber Co., 38 Chauncy St., Boston. Est. $150,000.

BANKS

PROPOSED WORK

Mass., Newton—Newton Trust Co., 282 Washington St., plans by Coolidge & Carlson, 89 State St., Boston, 2 story, basement, brick bank, Auburn St., Auburndale Sect. $150,000 or more. Noted May 28.

Que., Montreal—Royal Bank of Canada sketches steel, stone bank and office building, Dorchester and Beaver Hall Hill Sts. $300,000. **Maturity in March.**

OFFICES

PROPOSED WORK

N. J., Red Bank—Jersey Central Power & Light Co., Seabright Rd., 2 story, basement, brick, steel office. $150,000. **Maturity soon.**

Que., Montreal—See "Banks."

BIDS ASKED

N. J., Newark—W. E. Lehman, archt., 972 Broad St., bids about Mar. 1—on revised plans general contract 2 story, basement, brick, steel office, showroom, warehouse, Frelinghuysen Ave., for Majestic Radio Co., 259 Madison Ave., Perth Amboy. $150,000. Noted Jan. 22.

Ont., Toronto—Dec. 8, by North American Life Assurance Co., 199 Bay St., 7 story (ultimately 15 story), basement, 122 x 200 ft., concrete, brick, steel, stone office, King St. Total $1,500,000. Marani, Lawson & Morris, 38 Bloor St. W., archts. Noted Sept. 17.

CONTRACTS AWARDED

Del., Wilmington—Delaware Power & Light Co., general contract 58 x 150 ft., brick, rein.-con., steel office, plain found., 6th and Market Sts., to United Engineers & Constructors, Inc., 112 North Broad St., Phila., Pa., $400,000.

N. J., Westfield—Elizabethtown Consolidated Gas Co., 16 West Jersey St., Elizabeth, general contract 1 and 2 story, basement, brick, steel office, store, to F. Zurgard Constr. Co., 147 Schley St., Newark. Est. $150,000. Noted Nov. 12.

STORES

PROPOSED WORK

N. J., New Brunswick—J. Lefkowitz, 333 Handy St., soon lets general contract 1 story, basement, brick, steel store, French and New Sts. $150,000. H. G. Bach, 63 Schureman St., archt. Noted Nov. 12.

N. J., Plainfield—C. C. Gordon, 437 North Ave., Westfield, sketches 3 story, basement, 70 x 100 ft. store, apartment, East Front St. $150,000.

BIDS ASKED

N. J., Elizabeth—S. Cohen, archt., 130 Branford Pl., Newark, bids about Dec. 15, general contract 2 story, basement, brick, steel store, apartment, Magee Ave., for M. Bloom, c/o architect, $150,00. Noted Nov. 26.

N. J., Union City—P. L. Schultz, archt., 265 Summitt Ave., Union City, bids after Mar. 1, general contract 3 story, basement, brick, steel store, office, 169-73 Summitt Ave., for S. Slatkin, 17 Oak St., Weehawken, $150,000. F. W. Woolworth Co., Woolworth Bldg., New York, lessee. Noted Sept. 17.

N. Y., Brooklyn—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Brooklyn—B. Kushel, 7016 Bay Parkway, 6 story, basement, brick store, apartment, Bay Parkway and 71st St., separate contracts. $350,000. H. Hurwit, 131 West 38th St., New York, archt.

PUBLIC

PROPOSED WORK

Mass., Concord—REFORMATORY—Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, altering and constructing reformatory annex. $150,000. Architect not appointed.

Mass., New Bedford—MUNICIPAL—City, W. P. Hammersley, City Hall, municipal building. To exceed $150,000. Architect not appointed.

Mich., Bay City—COURT HOUSE—Bay Co. plans by J. C. Goodyne, 417 Bay City Bank Bldg., and takes bids about Jan. 19. 9 story, basement, rein.-con., Center St. $540,000.

Mich., Grand Rapids—CIVIC AUDITORIUM—City plans by Robinson & Campau, 715 Michigan Trust Bldg., and takes bids general contract before end of year, 240 x 280 ft., brick, limestone, steel, rein.-con. civic auditorium, plain found., Lyons St. $1,000,000. Noted Oct. 1.

N. J., Edgewater—BORO HALL—Bd. Boro Council, Boro Hall, 2 story, brick, steel addition, east side River Rd. $150,000. Architect not appointed.

N. J., New Brunswick — LIBRARY — New Jersey College for Women, Nichol and Sey Aves., 1 and 2 story, basement library and gymnasium. $150,000.

N. Y., Brooklyn—COURT HOUSE—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, magistrates and municipal court, Coney Island. To exceed $150,000. Funds not appropriated. **Maturity indefinite.**

BIDS ASKED

Calif., Martinez—HALL of RECORDS—Dec. 18, by County Clerk Contra Costa Co., 3 story, basement, Class A steel, rein.-con. $300,000. J. J. Donovan, 1916 Bway., Oakland, archt. Noted Nov. 15.

Mich., Caro — COURT HOUSE — Jan. 4, by Supervs. Tuscola Co., Caro, court house, $250,000. W. Kuni, 1005 Francis Palms Bldg., Detroit, archt. Noted July 9.

Mo., St. Louis—AUDITORIUM, etc.—Bd. P. Serv., City Hall, bids about Feb. 1, general contract (1st unit), 7 story, basement, 322 x 493 ft., rein.-con., brick, steel, stone; municipal auditorium and soldiers memorial; Market St. from 14th to 15th Sts. $3,000,000. Total $5,000,000. Plaza Comn., Inc., c/o LaBeaume & Klein, 716 Amer. Trust Bldg., archt. Noted Aug. 2, 1928.

N. J., New Brunswick—COURT HOUSE—Dec. 10, by Bd. Freeholders Middlesex Co., County Record Bldg., rebuilding 5 story, basement, brick, steel court house, connecting tunnel recently destroyed by fire. $150,000. Boylan & Levine, 143 Albany St., archts. Noted Nov. 19.

N. Y., Jamaica—ARMORY— Dec. 10, by Armory Bd., City Hall, armory for 104th Field Artillery, 93rd Ave. and 168th St. C. B. Meyers, 31 Union Sq., New York, archt. Noted Oct. 8.

N. Y., New York—OFFICE—Dec. 21, by S. Levy, pres. Manhattan Boro, Municipal Bldg., 10 story municipal building annex, Worth, Leonard, Center and Lafayette Sts., for Dpt. Health, Hospitals & Sanitation. $5,000,000. C. B. Meyers, 31 Union Sq., archt.

Okla., Pawnee—COURT HOUSE—Dec. 7, by Pawnee Co., c/o J. M. Perry, clk., 4 story, basement, 78 x 105 ft., rein.-con., brick, stone, incl. 12 jail cells equipment. Smith & Senter, Philtower Bldg., Tulsa, archts.

Tex., Longview—COURT HOUSE and JAIL—Dec. 21, by Gregg Co., c/o W. R. Hughes, judge, 5 story, 93 x 110 ft., light brick, terra cotta, steel, Square. $200,000. Voelker & Dixon, Perkins-Snider Bldg., Wichita Falls, engrs. Noted Nov. 19.

CONTRACTS AWARDED

Ore., Portland—MUSEUM—Portland Museum Assn., general contract 2 story, basement, 100 x 100 ft., marble tile art museum, 5th and Taylor Sts., to L. H. Hoffman, Pub. Serv. Bldg., $117,500; heating, to Urban Plumbing Co., 605 Washington St., $15,252; plumbing, to J. F. Shea, Henry Bldg., $3,095; electrical work, to Jagger-Sroufe Co., 106 10th St., $2,727. Grand total $138,574.

UNCLASSIFIED

PROPOSED WORK

Mich., Detroit — MERCANTILE — Gladwin Park Realty Co., c/o Snyder & Mitschke, archts., Union Guardian Bldg., 2 story, basement, 82 x 210 ft., brick, steel, rein.-con., plain found., Gladwin Park. $150,000.

N. Y., Brooklyn—COMMUNITY—Corporation, c/o J. Shields, 307 Atlantic Ave., plans by J. P. Boyland, 305 East Kingsbridge Rd., New York, 3 story, 60 x 110 ft., Atlantic Ave. and Hoyt St.

N. Y., Syracuse—EXCHANGE—New York Telephone Co., 219 South State St., soon lets contract telephone building, 103 Draper Ave. To exceed $150,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts.

Okla., Oklahoma City—STATION—Atchison, Topeka & Santa Fe R.R. Co., Railway Exch. Bldg., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., bids in December 1 and 2 story, basement, 74 x 242 ft., steel, concrete, stone main building, 1 story, basement, 66 x 138 ft., express, baggage and mail section, California and Santa Fe Aves. H. W. Wagner, Topeka, Kan., div. engr. Noted July 23.

Pa., Phila.—EXCHANGE—Bell Telephone Co., 1835 Arch St., plans by J. T. Windrim, 1701 Chestnut St., 2 story, basement, 44 x 116 ft., rein.-con., brick, limestone, granite, plain found., 54th and Woodland Sts.

Pa., Phila. — PHILOSOPHICAL — American Philosophical Society, A. W. Goodspeed, secy., 104 South 5th St., plans (to be started after Dec. 4) by P. P. Cret, Architects Bldg., philosophical building, 16th and Cherry Sts. $2,500,000.

R. I., Pawtucket—COMMUNITY—Fairlawn Community Assn., 59 Owen Ave., sketches by W. C. Mustard, 60 Barnes St., Providence, 2 story, basement, brick, Grotto Ave. $150,000.

BIDS ASKED

Calif., San Francisco—WAR MEMORIAL and OPERA HOUSE—Dec. 15, by War Memorial Trustees, carpentry and mill work for opera house and roofing for opera house and war memorial, Civic Center, for City and San Francisco Co. Noted Oct. 1.

N. J., Plainfield—EXCHANGE—New Jersey Bell Telephone Co., 132 West 2nd St., bids about Feb. 1, general contract 2 story, basement, brick, steel central office building, Park Ave. and West 5th St. $150,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted July 23.

CONTRACTS AWARDED

Calif., Monterey — MAUSOLEUM — E. H. Tickel, et al, Carmel, 1 story, Class A rein.-con., 500 crypts, to T. L. DeCew, San Carlos Hotel, Monterey, $165,000.

Calif., San Francisco—EXCHANGE—Engineering Dpt. Pacific Telephone & Telegraph Co., 140 Montgomery St., 2 story, basement, rein.-con., brick, to Macdonald & Kahn, Financial Center Bldg., $170,000. Noted Nov. 19.

Md., Elkton—PASSENGER STATION—See "Railways, under Maryland."

Mass., Somerville — LEGION — Somerville Post, American Legion, J. McCarron, chn. building com., 3 story, basement, brick, stone, steel, plain found., to C. C. Temple Co., 99 Chauncy St., Boston. Est. $150,000. Noted Nov. 26.

Constr. News page 207

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Stockton—METER SHOP—Pacific Gas & Electric Co., 245 Market St., San Francisco, plans by Engineering Department of owner, 1 story, brick, steel. $40,000.

Conn., Greenwich—HIGHWAY MAINTENANCE—State, Hartford, highway maintenance building, Mianus St. $40,000. S. E. Minor & Co., Smith Bldg., engrs. **Maturity after Jan 1.**

Mass., Boston—FACTORY—Manufacturing cooperative Work Rooms, lessee, Dragon Bldg., c/o H. A. Mears, archt., 120 Tremont St., altering 4 story, brick, light manufacturing building, 36 Washington St. $40,000.

Mass., Gardner—FACTORY—Tyson Bros., Woodbridge, N. J., c/o Gardner Industrial Corp., 2 story, brick, concrete factory. $40,000 or more. Private plans.

Mass., Reading—FACTORY—Ace Art Co., 12 Gould St., and D. J. Abrahams, 260 Tremont St., Boston, archt., soon lets contract 1 and 2 story, brick, steel addition, plain found. $40,000. Noted Nov. 19.

Mich., Wayne—AIRPLANE PLANT—Stinson Aircraft Corp., 1 story, brick, rein.-con., steel addition, plain found., Michigan Ave. $50,000. Private plans.

Miss., Greenville—COTTON GIN—Planters Gin & Milling Co., E. D. Davis, pres., sketches rebuilding cotton gin, destroyed by fire. $65,000, incl. machinery.

N. J., Elizabeth—FACTORY—Elizabeth Lumber Co., M. Goldberg, in charge, 1057 Grand St., rejected bids 2 story, basement, brick, steel, East Grand St., $40,000. J. Anderson, 251 North Broad St., archt. **Maturity indefinite.** Noted Nov. 19.

N. J., Manasquan—ICE PLANT—Block Ice & Cold Storage Co., C. Luker, engr., Toms River, rebuilding 2 story ice plant. $40,000. Architect not appointed. **Maturity soon.**

N. J., Plainfield—BAKERY—Owner c/o C. C. Bell, archt., 8 South Ave., Cranford, sketches 1 story, basement, brick bakery plant, $40,000.

N. Y., Brooklyn—ICE CREAM PLANT—Brookfield Ice Cream Co., 63rd St. and West 16th Ave., altering and constructing 2 story, concrete addition. C. G. Wessel, 1399 East 4th St., archt.

N. Y., Brooklyn—MANUFACTURING LABORATORIES—Ex Lax, Inc., 331 Atlantic Ave., sketches by V. Mayper, 110 West 40th St., New York, 6 story, 100 x 100 ft., Atlantic Ave. and Bond St. $150,000.

N. Y., New York—LAUNDRY—Victory Coat & Apron Supply, 306 East 96th St., sketches by N. Whinston, 570 7th Ave., laundry, 314 East 96th St. $250,000.

N. C., Charlotte—MILL—Lockwood Greene Co., archts., 102 East 42nd St., New York, soon let contract 4 story, basement, 90 x 182 ft., brick, steel, plain found., for Charlotteville Woolen Mills, Charlotte.

Tex., Orange—BAKERY—Stansbury Bakery, sketches modern bakery plant, incl. all new machinery, equipment.

Tex., Rio Grande City—REFINERY PLANT—Rio Grande City Oil Co., et al, refinery plant for refining crude into gasoline and oils. $175,000. Private plans.

Va., Alexandria—ASSEMBLY PLANT—Ford Motor Co., 3674 Schafer Rd., Dearborn, Detroit, Mich., sketches large assembly plant, on Potomac River.

Alta., Calgary—AMMUNITION FACTORY—Western Cartridge Co., Ltd., C. A. Voght, vice pres., sketches factory on 3 acre site. $300,000.

BIDS ASKED

Calif., Los Angeles—FACTORY and DISTRIBUTING UNIT—Loose-Wiles Biscuit Co., 811 Commerce St., Kansas City, Mo., A. E. Lemke, in charge, plans by C. Beelman, 1019 Union Bank Bldg., and bids about Dec. 12, (1st unit) 1 story, 80 x 220 ft. warehouse and distributing unit, with 45 x 60 ft. wing, 5 story, basement, 150 x 270 ft., Class A rein.-con. steel factory, Avalon Blvd. and Cage Ave. Total est. $2,000,000. Noted Nov. 19.

Conn., South Manchester—ICE PLANT—L. T. Wood, 51 Bissell St., taking bids 1 story, 62 x 125 ft., ice plant, loading platform, etc., brick, steel, Bissell St. and Johnson Terrace. $75,000. Frick Co., Inc., Waynesboro, Pa., archts.

N. J., North Bergen—FACTORY—C. O. Epperson, c/o North Jersey Industrial Terminal Co., 1827 Bergen Turnpike, bids about Jan. 15, general contract 1 story, basement, brick, steel, on 100 x 390 ft. site, 39th St. $40,000. Private plans. Noted Nov. 26.

N. Y., Brooklyn—FACTORY—See "Contracts Awarded."

N. Y., Maspeth—FACTORY—See "Contracts Awarded."

N. Y., New York—FACTORY—See "Contracts Awarded."

N. Y., New York—LAUNDRY—See "Contracts Awarded."

Tex., Edinburg—PACKING PLANT—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Mishawaka—FACTORY—A. Johnson Co., 1015 East Madison St., South Bend, general contract 1 story, 60 x 100 ft., rein.-con., brick, steel, to C. Van-Den Borre, 319 South Center St. Est. $40,000.

Me., Byron—MILL—Menderth, Inc., altering 2 story, brick, to F. A. Rumery Co., 533 Forest Ave., Portland. Est. $50,000. Noted Nov. 12.

La., Meraux—REFINERY—Tex York Utility Corp., additions and re-equipment refinery plant, day labor and separate contracts. To exceed $1,000,000.

Mass., Boston—BAKERY and COMMISSARY—Hayes-Bickford Lunch System, Inc., 1040 Boylston St., 1 and 2 story, basement, 60 x 120 ft., brick, rein.-con., concrete found., 32 Garrison St., to W. A. and H. A. Root Co., 250 Stuart St. Est. $40,000.

Mass., Hyde Park—MANUFACTURING—Bay State Upholstering Co., 100 Business St., 1 story, 100 x 165 ft., brick, timber, concrete found., to W. & L. Eng. Co., 694 Washington St., Boston. Est. $45,000.

Mass., Lynn—FACTORY—North Shore Cutting Die Co., 898 Broad St., altering and constructing 1 story, brick, steel addition, concrete found., to J. Broasky, 59 Callender St., Dorchester. Est. $40,000. Noted Nov. 26.

Mass., Quincy—OIL PLANT—Town River Oil Co., 36 Hill St., Quincy Point, bulk oil plant, incl. 5 vertical steel tanks, 47 ft. in diam. each, 30,165 bbl. capacity, Town River, to Chase & Roberts, Inc., Statler Bldg., Boston. Est. exceeds $25,000. Noted Nov. 26.

Mass., Watertown—MILK STATION—C. L. Woodland, 54 Waverly Ave., 1 and 2 story, ell, brick milk station additions, plain founds., to L. C. Titus, 60 Lincoln St., Watertown. Est. $40,000.

N. J., Edgewater—SOAP FACTORY—Lever Bros., 371 7th Ave., New York, general contract (superstructure, alterations) 2 story, 60x100 ft. refinery, 3 story, 60x115 ft. deodorizing building, 5 story, 65x180 ft. finishing building, and 1 story, 60x65 ft. boiler house, to White Constr. Co., 95 Madison Ave., New York. Est. $40,000. Noted Oct. 8.

N. Y., Brooklyn—FACTORY—C. Pfizer & Co., 81 Maiden Lane, New York, altering and constructing boiler addition, tank pits, fuel oil equipment, Gary St. and Marcy Ave., separate contracts. $40,000. Noted Nov. 19.

N. Y., Long Island City—FACTORY—E. Eisenacker, 204 West 14th St., New York, 2 story, 50 x 100 ft., 45th Ave. and 11th St., separate contracts. $40,000. **Maturity in January or later.** H. Feldman, c/o owner, archt. Noted Nov. 12.

N. Y., Maspeth—FACTORY—Maspeth Realty Associates, 162 Remsen St., factory, Maurice Ave. and 53rd Aves., separate contracts. $40,000. Private plans. Noted Nov. 12.

N. Y., New York—LAUNDRY—Benenson Realty Co., 124 Madison Ave., 2 story laundry office, 204 East 97th St., separate contracts. $110,000. C. Shaefer, Jr., 332 East 149th St., archt. Project in abeyance, pending granting of permit. Noted Nov. 19.

N. Y., New York—FACTORY—Superior Fireproof Door & Sash Co., 1811 Carter Ave., 2 story, Barnard and Barbour Sts., day labor and separate contracts. $40,000. H. Ginsberg, 205 East 42nd St., archt. Noted Nov. 12.

N. C., Greensboro—FACTORY—Pringle & Smith, archts., Norris Bldg., Atlanta, Ga., 2 story, basement, 78 x 120 ft., rein.-con., brick, plain found., to G. W. Kane, Greensboro, for Greensboro Coca Cola Co. $75,000. Noted Nov. 26.

Tex., Edinburg—PACKING PLANT—Rio Grande Valley Vegetable Co-operative Assn., c/o G. B. Warren, Rio Hondo, 1 story, 44 x 144 ft., steel sheet or ironclad modern vegetable and citrus packing plant, day labor. Private plans. Noted Oct. 15.

Wis., Appleton—PLANT—Lutz Ice Co., W. C. Jacobsen, secy., 109 North Morrison St., 2 story, 85 x 150 ft., rein.-con., brick, steel, Superior St., to Appleton Constr. Co., 201 East College Ave. Est. $40,000.

Wis., Neenah—LAUNDRY—J. Emerick, Waupaca, 1 story, 60 x 90 ft., rein.-con., brick, to Fluor Bros. Constr. Co., 48 Otter St., Oshkosh. Est. $40,000.

GARAGES

PROPOSED WORK

N. J., Jersey City—Lafayette-Greenville Bus Owners Assn. and Greenville Bus Co., 77 seaview Ave., 2 story, basement, brick steel garage and bus terminal, Gates Ave. and Merritt St. $150,000. **Maturity indefinite.**

BIDS ASKED

Mass., Amherst—H. B. Ketchen, 11 East Pleasant St., taking bids 1 story, irregular sized, brick, steel, auto super-service station, concrete found., East Pleasant St. $40,000. C. F. Dingham, 7 Grove St., Palmer, engr.

N. Y., New York—Jaham Realty Corp., 57 Mangin St., bids about Dec. 15, on separate contracts altering bottling plant into service garage, 57 Mangin St. $40,000. W. I. Hohauser, 17 West 44th St., archt.

N.Y., Ozone Park—See "Contracts Awarded."

N. Y., Woodhaven—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Middletown—L. Combe, 12 Main 1 story, wing, rein.-con., brick, steel auto s ice station, concrete found., to S. Annino, Hotchkiss St. Est. $40,000. Noted Nov. 12

N. Y., Brooklyn—H. M. Renken Dairy 584 Myrtle Ave., 2 story service garage, stor Classon and Myrtle Aves., to W. E. Anders 885 Flatbush Ave. Est. exceeds $40,0 Noted Nov. 12.

N. Y., Maspeth—Maspeth Realty Associat 162 Remsen St., 100 x 200 ft. service garag 53rd and Maurice Aves., separate contrac $50,000. Noted Nov. 19.

N. Y., Ozone Park—P. and W. Auto Co., In 86th St. and Libelty Ave., 1 story, 100 x 1 ft. garage and repair shop, 86th St. and 103 St., separate contracts. $40,000. C. Goodma 375 Fulton St., Brooklyn, archt. Noted Nov. 1

N. Y., Woodhaven—Liberty-Woodhav Realty Corp., 103-58 Woodhaven Blvd., 115 180 ft. service garage, Rockaway Blvd. a 93rd St., separate contracts. $40,000. Freshman, 50 Court St., Brooklyn, archt. **Maturity indefinite.**

POWER PLANTS

PROPOSED WORK

N. Y., Plymouth—L. T. Stewart, c/o Tow Clerk, electric plant, system, Chenango Co.

O., Cleveland—City Council power hous administration building for Easterly Sewag Treatment Plant. G. B. Gascoigne, Leader Bldg consult. engr. Noted Feb. 19, under "Sewers"

Okla., Shawnee—City, preliminary plan Diesel engine power plant for water plant and street lighting. $75,000. T. E. Thompson Shawnee, engr.

S. D., Aberdeen—City, c/o L. Kohlhoff, aud municipal power plant, distributing system Bemis Co., 332 South Michigan Ave., Chicag engrs.

Que., Hull—Gatineau Power Co. Ltd., C. G Gale, mgr., soon takes bids several power unit on Ottawa River between the dam at Timiskaing and Lac Allumette. $5,000,000.

BIDS ASKED

Mass., Canton—Drapel Bros. Co., Drape Lane, taking bids brick, concrete power plant Draper Lane. $40,000. Allen Eng. Sales Co., 142 Berkeley St., Boston, archt.

Miss., Starkville—Dec. 11, by City, T. J Gladney, city clk., electric light plant distribution system. Noted Nov. 19.

Pa., Cresson—Dec. 9, by Comrs. Pennsylvania State Tuberculosis Sanitarium, boiler plant improvements, constructing underground ga and electric lines. $50,000. C. A. Blatchley Drexel Bldg., Phila., engr.

CONTRACTS AWARDED

N. J., Irvington—Pub. Serv. Electric & Gas Co., Terminal Bldg., general contract 2 story basement, 40 x 110 ft., brick, steel, electri sub-station, Springfield Ave., to United Engineers & Constructors Inc., 80 Park Pl., Newark. Est. $115,000. Noted July 9.

WAREHOUSES

PROPOSED WORK

Mass., Gloucester—Gloucester Fish Pier Corp., J. A. Dahlmer, preliminary survey by Fay, Spofford & Thorndike, 44 School St., Boston, warehouse and refrigeration plant at Gloucester Fish Pier. $50,000 or more.

Mass., Salem—Cressey-Dockman & Co., 104 Jackson St., plans by W. H. Hunt & Son, 108 Essex St., 1 story, brick steel warehouse, plain found., Jackson St. $40,000.

N. J., Irvington—N. J. Convery, archt., 32 Walnut St., Newark, bids after Feb. 1 on revised plans 2 story, basement, 50 x 200 ft brick, steel warehouse, Lyons Ave., for Owner c/o architect. $150,000. Noted Oct. 1.

Okla., Enid—General Development & Shar Corp. plans by G. E. V. Blumenauer & Associates, 1501 Broadway Tower Bldg., 2 story 100 x 300 ft., rein.-con., brick, steel termina freight warehouse. $270,000. **Maturity in 1932.**

P. I., Manila—Ynchausti & Co., Manila and 17 Battery Pl., New York, reconstructing distribution and shipping plant, destroyed by fir To exceed $250,000. **Maturity indefinite.**

BIDS ASKED

N. J., Newark—T. C. Hughes, archt., 15 Central Ave., Newark, taking bids general contract altering and constructing 2 story, basement warehouse addition, Ogden and Rector Sts., for Alliance Investment Co., 810 Broad St $150,000

N. Y., New York—See "Contracts Awarded."

N. Y., Syracuse—See "Railways under New York."

CONTRACTS AWARDED

N. Y., Mount Vernon—Gristede Bros., 1885 Park Ave., New York, distribution station MacQueston Parkway, Grove and South Sts to Barney Ahlers Constr. Co., 110 West 40th St., New York. Est. exceeds $50,000.

N. Y., New York—R. Cohen, 139 Bway altering lodging house into warehouse and constructing addition, separate contracts. $40,000 J. Fisher, 45 Astor Pl., archt. Noted Nov. 19

Okla., Enid—General Development & Share Corp. 1 story, 150 x 225 ft., steel, terra cotta concrete market, to W. E. Krumrei, Enid Est. $125,000

Constr. News page 208

See proposal advertising on page 77